

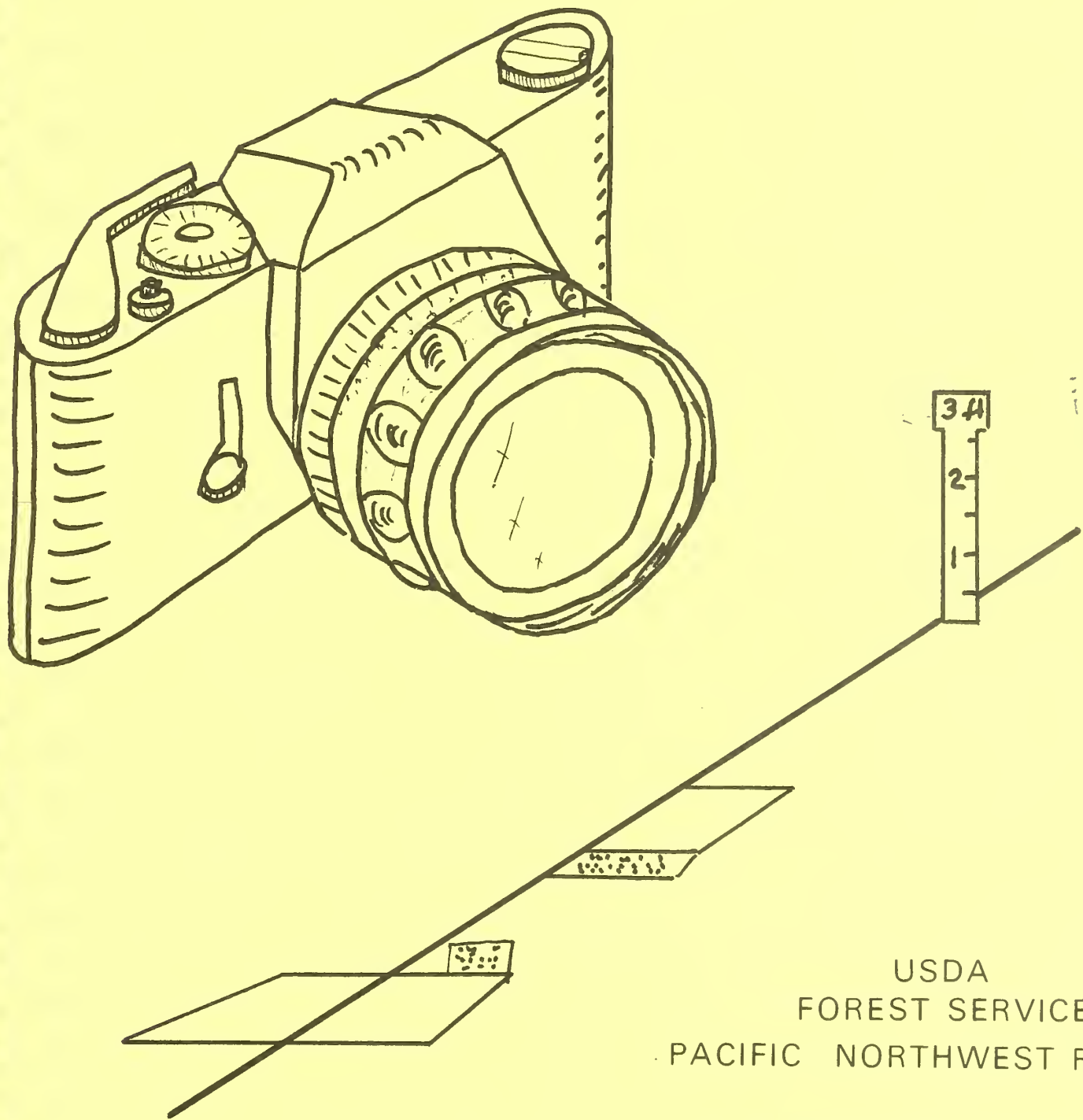
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RANGE TREND SAMPLING BY PHOTOGRAPHS



USDA
FOREST SERVICE
PACIFIC NORTHWEST REGION

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RANGE TREND SAMPLING BY PHOTOGRAPHS

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RANGE TREND SAMPLING BY PHOTOGRAPHS

R6 Regional Guide 2-1
Frederick C. Hall

INTRODUCTION

Since 1954, the USFS has evaluated trend in range condition by use of Dr. Ken Parker's Three Step Method. The purpose of evaluating trend is to appraise livestock grazing impacts on vegetation and soil. If an area is in fair or poor condition, livestock adjustments should be made to attain an upward trend in vegetation and/or soil. If range and soil are in good condition, livestock should be managed to prevent a downward trend. The Three Step Method was designed to measure response of vegetation and soil as they are influenced by livestock use. Thus, the method provided land managers with a means of assessing their management.

About 1970, after 15 years of use, the Three Step Method was critically analyzed under leadership of the Rocky Mountain Forest and Range Experiment Station. A comprehensive appraisal of the Method was given by Reppert and Francis (1970). Their evaluation produced three kinds of comments: those directed at methodology problems with the sampling system, those concerned with personnel inadequacies in training and procedures, and those dealing with recommendations. The sampling systems proposed in this paper are an attempt to apply their findings.

Sample method problems were three:

1. The 3/4 inch loop did not measure "true" basal area but was biased toward higher basal areas.
2. The 3/4 inch loop generally did not "hit" enough plant species in sparse vegetation to represent a good evaluation of species composition.
3. The system was not amenable to statistical analysis.

Procedures proposed in this paper relate to these problems as follows.

1. Twenty photographs of a one square foot plot are taken to document crown cover and basal area cover of plants.
2. The 3/4 inch diameter loop is enlarged to one square foot plot repeated 20 times instead of 100 times.
3. The problem of statistical evaluation was not solved. Current proposals result in average frequency, density, and basal area per transect with only three transects (two degrees of freedom) similar to the Three Step Method. Analysis of vegetation and ground cover change is accomplished by comparison of plot photographs rather than by statistical analysis.

Personnel problems enumerated by Reppert and Francis (1970) were five:

1. Photographs required in the Three Step procedure were either lacking or of such poor quality as to be useless.

2. A transect was laid across two or more different sites thereby invalidating a single listing of species composition or species density for the transect.
3. The wrong range condition score card was used for data analysis.
4. Plant species were incorrectly identified or the same species were identified as different plants by different investigators.
5. The sampling system was incorrectly installed on the ground which made comparison of results invalid.

All five problems are directly related to poorly trained or inattentive people. They will occur with any sampling system. Simplifying a sampling method can only attack problem number five -- procedural errors. Poor photographs, selecting non-homogeneous sites, use of inappropriate score cards, and incorrect species identification all require training of individuals.

Reppert and Francis (1970) had two very significant conclusions:

1. Photographs were the most useful part of the Three Step Method. They documented transects across two or more sites, helped evaluate species identification, and were used to appraise choice of range condition score cards.
2. Supplemental data are needed in regard to: site description, livestock use during the sampling year and previous years, general weather trends of the years between readings, big game utilization on the area during the preceeding 12 months and the years between readings, and an ecologically sound evaluation of range condition.

All systems described here are based upon photographic records. They are utilized in three ways:

1. A stereo photograph system of one square foot plots laid down at five foot intervals along a 100 foot transect (20 plots) as a scientific documentation of range trend.
2. A oblique photograph system of three foot by three foot (nine square foot) sample plots which duplicates and supplements standard procedure in the Three Step Method. The 9 sq. ft. sampling system is not a scientific measuring device but a photo documentation of vegetation and soil impacts. Both the 1 sq. ft. and 9 sq. ft. sampling systems may be applied on existing Three Step transects or they may be used as new sampling systems elsewhere.
3. A special photographic "system" to document environmental impacts. It does not have a specified format. A transect up to 100 feet long is used along which special items such as depth and severity of erosion, streambank edges, vegetation pattern, or other items may be documented by photographs and precisely relocated and measured.

The primary sampling tool is a 35mm camera with a 50 to 55mm lens and a stereo attachment.

LOCATING A SAMPLE AREA

Location of 1 sq. ft. or 9 sq. ft. trend transects has three primary requirements:

1. The site under each transect must be homogeneous. If an entire cluster is to represent a single site, the sites under each of the three transects must be both homogeneous and similar to each other.
2. The kind of site selected should be one that is sensitive to livestock use. For example, in a complex meadow where dry meadow around the edge grades into moist meadow which finally grades into wet meadow, the most desirable sampling location would be in dry meadow because it is most sensitive to livestock abuse.
3. Locate the sample in an area which best represents current livestock utilization.

These three criteria, a homogeneous site sensitive to livestock use in an area of moderate to heavy livestock utilization, will generally satisfy the objectives of monitoring management effectiveness by: photographic documentation of data; evaluating sensitive areas which when indicating an upward trend imply that less sensitive areas are in a faster upward trend (or are in better condition); and distributing sampling locations on a least cost or a cost effective basis.

The most difficult aspect of sample location deals with suitable representation of current livestock activity. Samples on a range area (allotment) grazed season long may not be suitably located or sufficient in number for the same area under rest rotation grazing. Furthermore, transect location may be difficult in an allotment which has had a major change in management, for instance from season long to rest rotation, until livestock distribution over an entire grazing sequence has been evaluated. Selection of a site sensitive to livestock use in a unit under spring grazing might be quite different from that selected in the same unit under fall grazing.

Sample location requires a great deal of professional expertise liberally mixed with artistic finesse. The investigator must understand seasonal and topographic effects on livestock distribution, seasonal effects on plant community and soil sensitivity to grazing, and he must have critical eye for site homogeneity.

TECHNIQUES FOR PHOTO SAMPLING RANGE TREND

General Considerations

The following comments pertain to 1 sq. ft., 9 sq. ft., and special photographic techniques. All transects should have site description and map (R-6 2210-58). An example of this form is on the next page.

Form R-6 2210-58: Circle kind of sample (upper right edge). Most items are self explanatory such as entering date installed, the name of Forest, District, range area (allotment), unit, and TRI information. Ecoclass code is obtained from R-6 Regional Guide 1-3 (Pacific Northwest Ecoclass Identification: Concept and Codes). Grazing system should be entered (such as season long,

PHOTO RANGE TREND SAMPLE: 1 sq. ft. 9 sq. ft. Special

Cluster Description

Date Installed 8-12-75
 Forest Ochoco
 District Grasslands
 Range Area Round Butte
 Unit Juniper Burn
 TRI: Compartment _____
 Cell _____

Cluster 2
 Number of transects: 1 2 (3)

ECOCCLASS CJ-S2-11
 Community Type Juniper / big
sage / wheatgrass

Grazing system:

Type rotation Date 4-68
 _____ Date _____
 _____ Date _____

Kind of animal: Cattle Sheep
Horses Goats

Location: S. center Sec. 18
T. 11S R. 13E

Description: the four (4)
fourties south for the
center of the section.

Site Data: Elevation 2850 % Slope 10
 Slope aspect: N NE (E) SE S SW W NW
 Slope position: Top Up 1/3 (Mid) Low 1/3 Bottom
 Micro topography: Convex (Flat) Concave
 Macro topography: Flat (Undulating) Rolling Steep
 Rough Broken

Geology:

Deposition: Wind Stream Lake Colluvial (Residual)
 Other _____

Material: Limestone Mudstone Sandstone _____
 Granitic Serpentine Dioritic _____
(Basaltic) Andesitic Rhyolitic _____
 Tuffaceous Cinders Pumice Ash _____
 Composite Other _____

Soil:

Kind of Restriction: Absent Clay pan (Bedrock)
 Cemented Other _____

Depth to restriction 28" Rooting Depth 28"

Surface compaction: None (Slight) Moderate Severe

Soil Profile Stone: Absent Gravelly (Stony)

Topsoil: Less 10% (10-30%) 30-50% 50-70% Over 70%

Subsoil: Less 10% 10-30% (30-50%) 50-70% Over 70%

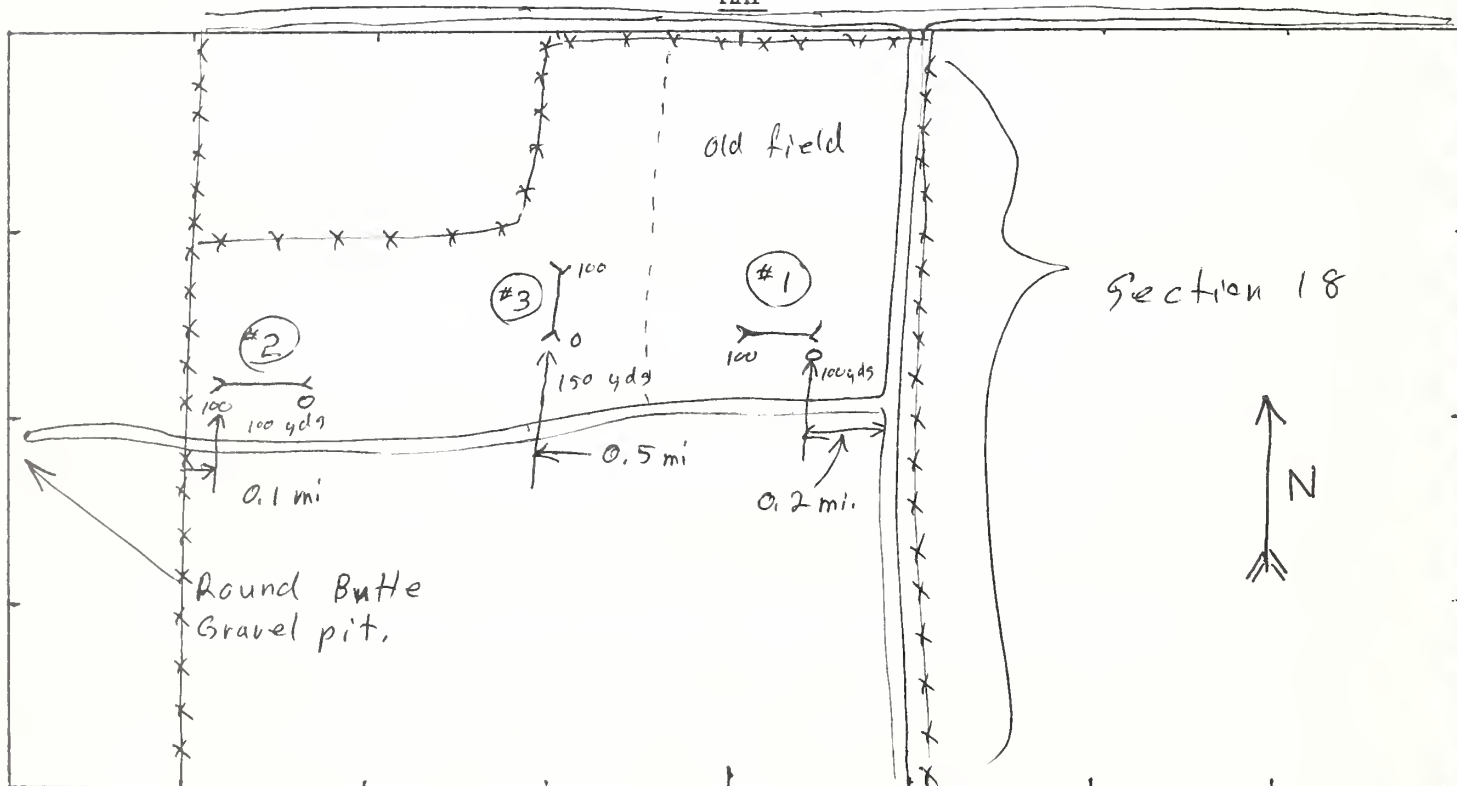
Soil Texture:

Topsoil: Sandy (Loamy) Silty Clayey Ashy

Subsoil: Sandy Loamy (Silty) Clayey Ashy

Other: _____

MAP



deferred-rotation, etc.) and the date when installed. This is important information when interpreting trend. Circle the kind (or kinds) of domestic animals using the sample area. Describe location by both standard survey nomenclature and a description of where the sample is located in relation to land, vegetation, or road features. Describe it as if you were telling someone how to find it. Then diagram the sample layout in the MAP space. Note location of identifiable features, distances, compass bearings, transect location and orientation, and where the 0 ft. and 100 ft. ends are. The right side of form '58 is for site description. Enter elevation and percent slope. Then circle the item best describing aspect, slope position, micro (within one acre) and macro (within one section) topography, kind of soil deposition, soil parent material, and kind of restriction to rooting depth (if there is a restriction within five feet of the soil surface). Enter depth to restriction and rooting depth. Circle items describing soil compaction, soil stone and texture. A space is provided for other comments.

Equipment for photographic sampling is simple: 35mm camera with 50 or 55mm lens, clipboard with photo identification and plot diagram forms, 100 foot steel tape, sufficient angle iron stakes for the number of transects desired (three stakes per 100 foot line), fencepost for cluster identification, pair of clamps for holding the 100 foot tape onto the angle iron stakes, three dimensional adapter for the 35mm camera, either a 1 sq. ft. or 9 sq. ft. plot, and as optional a size control board.

Choice of film is of concern. Range trend sampling is designed to measure change in vegetation and soil over time. Photographs 5, 10, or 15 years ago are compared to current photographs. Therefore, film must be selected that will retain its sharpness and clarity for at least a 20-year time span. I strongly recommend black and white film always be used. It can be supplemented by color film. Color film will fade with age thereby greatly reducing its usefulness for identifying species and also causing it to lose sharpness and clarity. I would also recommend using film with an ASA rating of 100 or better. For example, Plus X Panchromatic Film, ASA 160, has good contrast and fine grain. Color negative film is recommended to facilitate printing of both slides and photographs. The highest ASA rating possible should be used. Higher ASA ratings mean smaller f-stops (higher f-number) can be used which will produce the greatest depth of field.

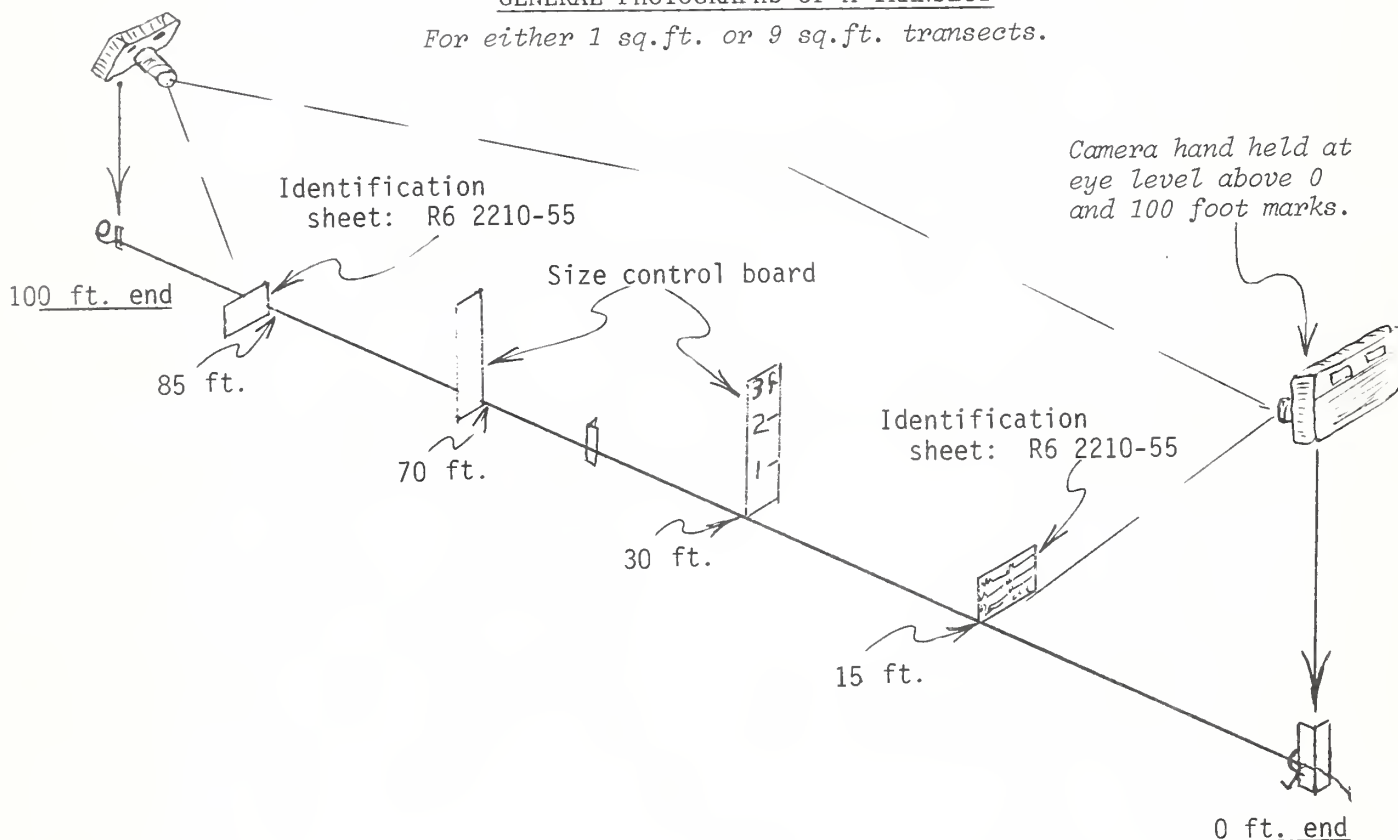
Season of year when photographs should be taken depends upon objectives and past history. Reppert and Francis (1970) recommended sampling be repeated within plus or minus two weeks of the original date. When placing the 1 sq. ft. or 9 sq. ft. transects on top of existing Three Step transects, date of sampling should be governed by the original readings. When establishing new transects, date of installation should be governed by plant growth development (phenology) and season of livestock use. In general, a good time to sample is when decreaser plants are well into flowering or are just completing their maximum seasonal growth.

Transect layout is similar to three step instructions. Zero footmark on the tape is aligned with the angle iron stake, the midstake is located between footmark 50 and 51, and the endstake is located between 99 and 100 footmark. Make sure the zero end is labeled and that zero and 100 foot ends are properly documented on the map (R-6 2210-58).

Each transect should have a photograph taken from both the zero and 100 foot end.

GENERAL PHOTOGRAPHS OF A TRANSECT

For either 1 sq.ft. or 9 sq.ft. transects.



Each photograph should be labeled with an identification sheet as depicted (R-6 2210-55). Place photo identification sheet at 15 feet, place a size control board at 30 feet, hold camera at eye level and photograph the transect in a way that will place the photo identification sheet at the bottom of the picture (see examples on pp 9, 18). Repeat this procedure at the 100 foot end of the tape placing identification sheet at footmark 85, and size control board at footmark 70.

Form R-6 2210-55: (Appendix 1). This form can be used for both the 0 end and 100 ft. end of a transect, print information in large letters similar in size to those on the form. This size can be read on the photographs (example p. 9). Circle "0" in upper right corner for 0 ft. end. After taking the picture, cross out the "0" and circle the "100" for the next picture.

A size control board is an optional, but highly desirable piece of equipment (see appendix 3). The illustrations on pages 9 and 18 have a size control board marked with "1M" indicating one meter, and decimeters labeled as 2, 4, 6, and 8. In this way depth of grass, height of shrubs, or other factors can be depicted.

General transect photographs from the 0 and 100 foot ends should be taken with the 3-D attachment on 1 sq. ft. transects and without the 3-D attachment on 9 sq. ft. transects. In addition, a standard photograph (without 3-D) is highly desirable on 1 sq. ft. transects to encompass a wider horizon of the plant community and, when color slides are produced, to use in slide talks dealing with range trend.

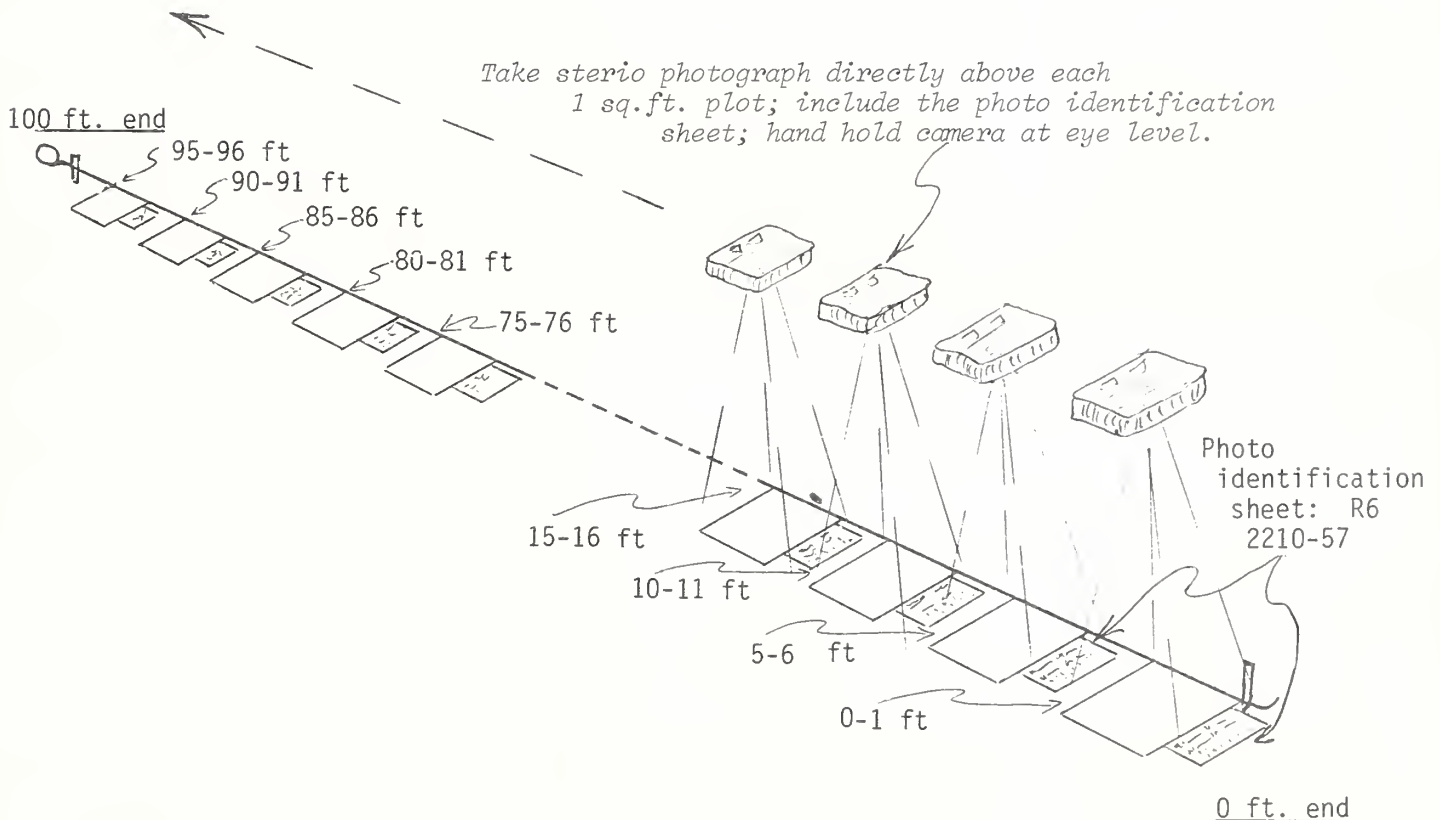
One Square Foot Plot Transect.

Each 1 sq. ft. plot is photographed in stereo to provide a permanent, visual record of vegetation and soil surface conditions. At a later time, the same transect will be rephotographed to provide a comparison set of pictures. Range trend is interpreted by comparing original and follow up photos of each 1 sq. ft. plot to appraise changes in species presence, density and basal area, assessing species frequency and shrub line intercept, and evaluating changes in soil surface characteristics. Photographs are used to reduce observer error in measuring or estimation vegetation and soil parameters, aid in evaluating plant identification, facilitate illustration of range trend or lack of trend, and to eliminate observer error in comparing transect readings taken at different times. Anybody can compare and measure the difference between photographs. Stereo photographs greatly aid species identification and interpretation of vegetation and soil parameters. Try evaluation on $\frac{1}{2}$ of a stereo pair -- then view it with a stereoscope!

The technique for sampling a 1 sq. ft. plot transect is illustrated below. A three dimensional adapter for 35mm cameras with 50 or 55mm lenses is required for both general and 1 sq. ft. plot photographs. Take general pictures from the 0 ft. and 100 ft. ends first to show vegetation prior to trampling caused by placing and photographing the 1 sq. ft. plot. Plots are placed up hill of the transect line, or if there is no slope, to the left of the steel tape. Details of sampling are discussed next under "form R-6 2210-59". In brief, a 1 sq. ft. plot is placed at footmark 1, plants within the plot are identified and diagrammed, the plot is photographed by hand holding the camera with stereo adapter directly over the plot, and shrub crown intercept between footmark 1 and 5 is recorded by species. This procedure is repeated at footmarks 5, 10, 15, 20, etc. Tree crown cover must be sampled on forested areas.

1 SQ.FT. PLOT TRANSECT

20 plots



Form R-6 2210-59 is illustrated on the following pages. It is utilized for diagramming plants and mounting photographs of the 20 plots. Each sq. ft. plot photograph is individually labeled by form R-6 2210-57 (see appendix 1 and page 9). On form '59, fill in date, Forest, District, range area (allotment), unit, cluster, transect number, and the investigators name. Season of use means when during the previous 12 months the area was used such as season long, spring, summer, fall or winter. "Percent use" is the average utilization at the time of use. Grazing system means the kind currently being used. Any comments may be made under "remarks". The example notes: "burned 9-3-75. First growing season sampling".

Place the 1 sq. ft. plot at the first location, between 0 and 1 foot. Roughly diagram location of each plant species and label them as shown on pages 9 and 10. A precise diagram is not essential; it is used for species identification. The stereo photograph is authority for plant and soil condition. Fill in form R-6 2210-57 and circle picture number one. Place the photo identification form on the ground next to the transect tape and adjacent to the square foot plot and prepare to photograph. With a stereo adapter attached to the camera, hold camera at eye level directly above the plot and expose for both square foot plot and photo identification paper. Caution: Expose for both photo identification paper and the plot. Generally paper will reflect more light than vegetation and soil therefore, the paper should be slightly overexposed while soil and vegetation are slightly underexposed. Acceptable paper exposure is essential to read printing on each plot photo identification. Note difficulty in reading plot identification on page 9 at the zero to one footmark. Next, record by species shrub and tree under 6 ft. tall crown cover intercept above the transect tape between 0 ft. and 5 ft. marks. Record beginning and ending footmarks and number of feet intercept (example page 10).

Move plot to next location between footmarks 5 and 6. Repeat plant diagrams, photography and shrub line intercept between 5 ft. and 10 ft. marks. Remember to "X" out photo 1 and circle photo 2 on form R-6 2210-57. Repeat this procedure for all 20 plots. Appendix 2 has a complete form R-6 2210-59 which may be duplicated for field use.

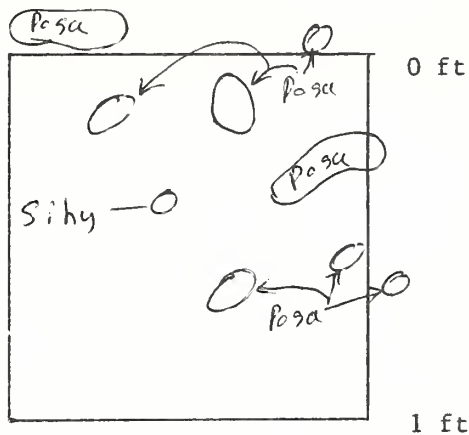
After all 20 plots have been photographed and diagrammed, the transect is summarized on the last page of form R-6 2210-59 (page 11). The left side documents frequency and line intercept by species. List all species diagrammed as falling within plots and all shrubs listed as having crown cover intercept. Sometimes a shrub species will occur as rooted in a plot for frequency and as having crown intercept: record the shrub species in both cases. For frequency, count the number of plots in which the species occurred and record. For intercept, total the number of feet for each species and record.

The same procedure is followed at the bottom of the species listing for items of bare soil, gravel pavement, rock, litter, and moss/lichens. Determine number of plots in which each of these items occurred. In the illustration, bare soil occurred in 15 sample plots, gravel pavement in 1, rock in 7, litter in 7 plots while moss/lichens did not occur.

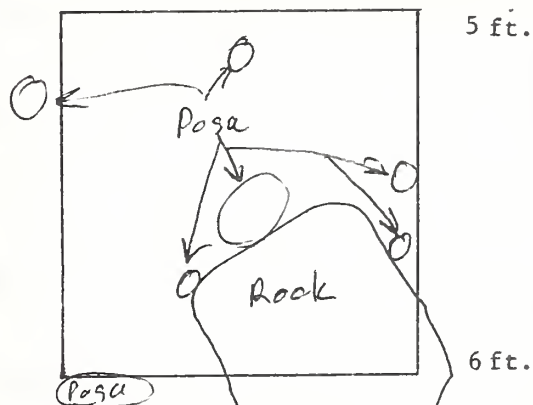
The rest of form R-6 2210-59 is devoted to supplemental information. Record those species sustaining the greatest percentage of utilization regardless of whether they are decreasers or not. The objective is to

Date 4-13-76
 Forest Ocho
 District Grasslands
 Range Area Round Butte
 Unit Juniper burn
 Cluster 2
 Transect 2
 Investigator F. C. Hall
 Season of use na % use na
 Grazing system rotation
 (currently deferred)
 Remarks burned 9-3-75.
First growing season sampling

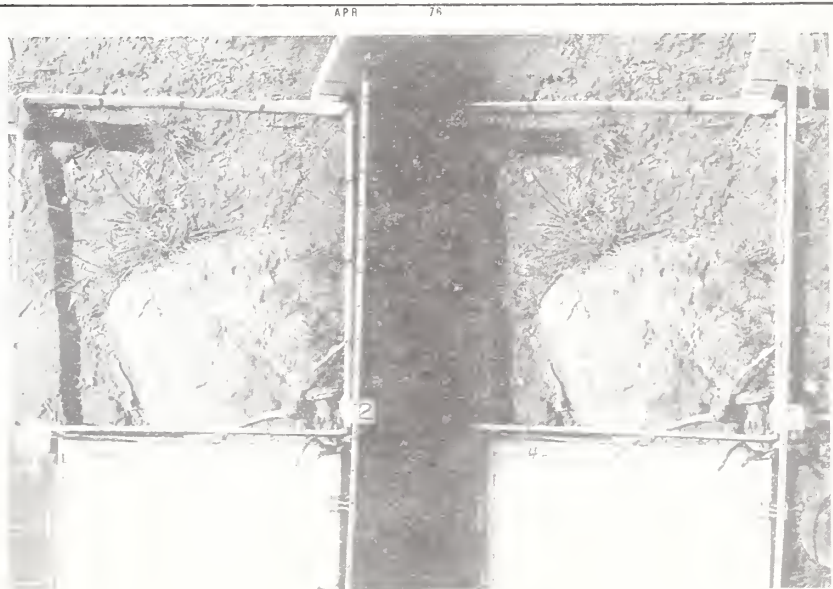
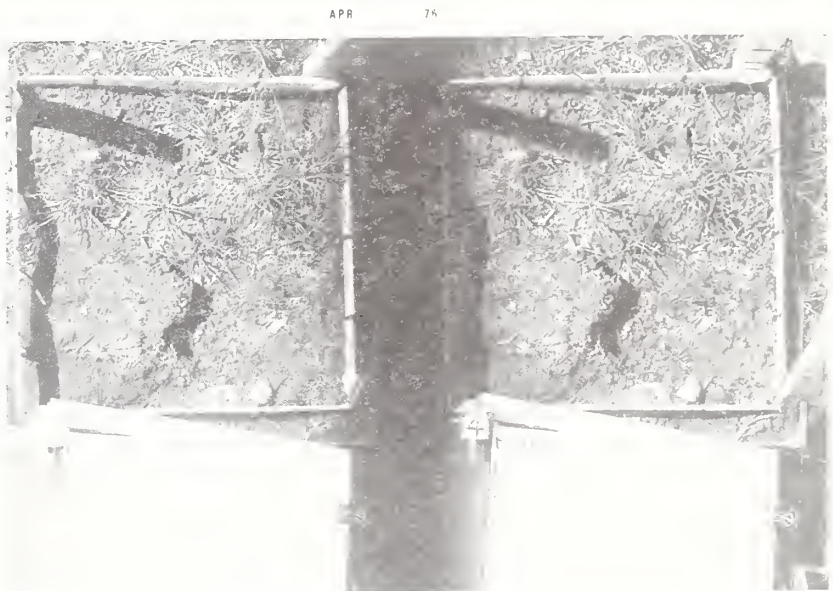
PLOT SIZE 1 sq.ft.

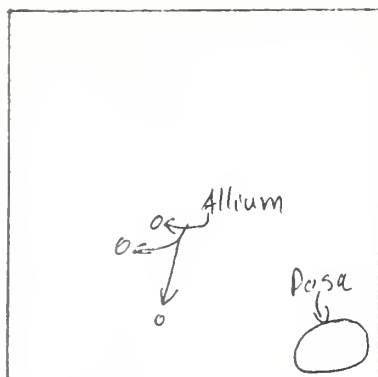


Line Intercept			
Species	From	To	Feet



Line Intercept			
Species	From	To	Feet



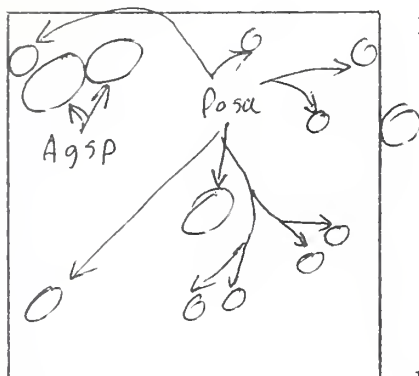
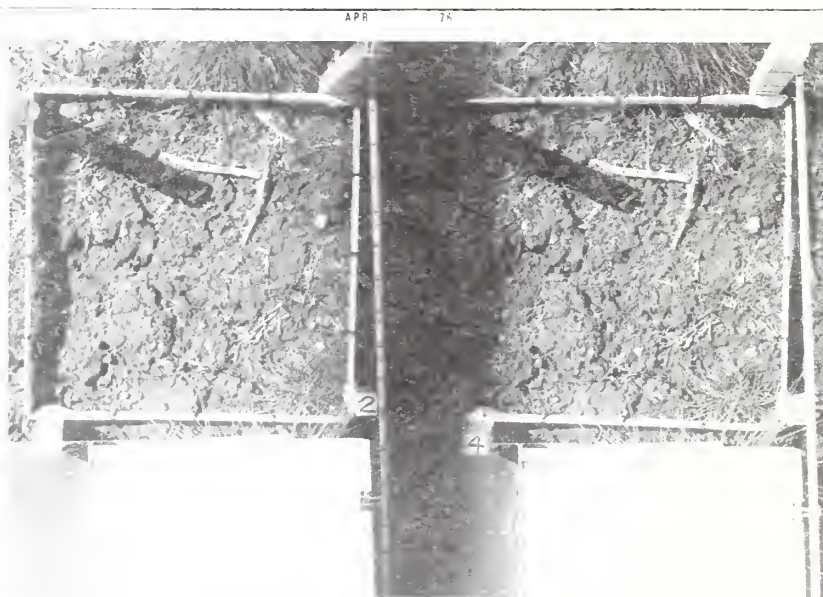


10 ft

Line Intercept

Species	From	To	Feet

11 ft.

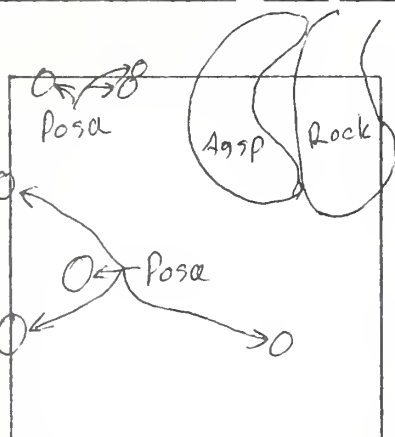


15 ft

Line Intercept

Species	From	To	Feet

16 ft

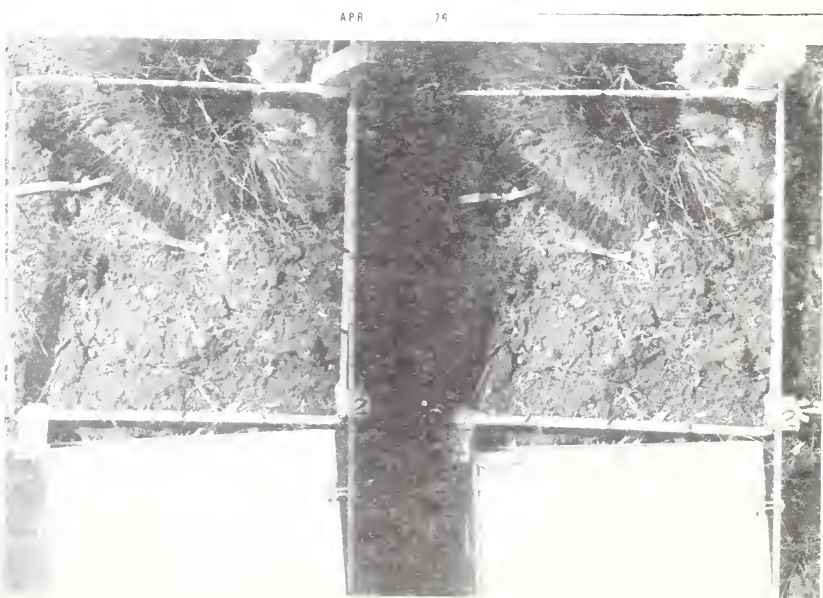


20 ft

Line Intercept

Species	From	To	Feet
Arar	22.5	23.5	1

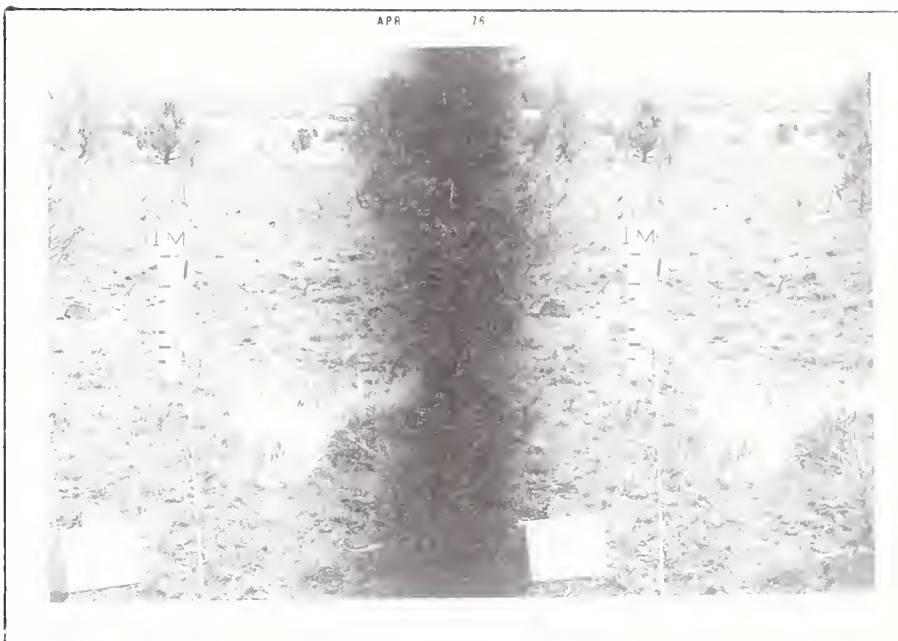
21 ft



SUMMARY

Species	Frequ.	Interc.
Agsp <input type="checkbox"/>	8	
Poa <input checked="" type="checkbox"/>	19	
Sibb	1	
Allium	1	
Feld	2	
Fraseria?	1	
Monocot	2	
Lithofragma	1	

Arar 1,3, 47

ACTIVITIES

Logging

Fire burned 9-3-75

Revegetation

Insects

Wildlife

Other

CLIMATE compared to Average

	This Yr.	Last Yr.	2 yrs.	3 yrs.	4 yrs.
Temp.	+ 0 -	+ 0 -	+ 0 -	+ 0 -	+ 0 -
Ppt.	+ 0 -	+ 0 -	+ 0 -	+ 0 -	+ 0 -

Apparent range condition high fairApparent Trend unknown

Bare Soil <input checked="" type="checkbox"/>	15
Gravel pavement,	1
Rock <input type="checkbox"/>	7
Litter <input type="checkbox"/>	7
Moss/lichens	

*Estimated Utilization

Species	% Use
Agsp	70
Feld	70
Poa	85

Season of Use Fall

* Due to fire 9-3-75

COMMENTS

Vigor on Agsp seems low on those plants with a burn stubble less than 1 1/2"; Plants killed when burn stubble is less than 1/2".

Amount of old litter seems related to damage - plants with heavy litter damaged more than plants with grazed stubble.

document how much utilization occurred on which species, not to estimate "proper use". After estimating current utilization, list season when utilization occurred. In the illustration, bunchgrasses sustained 70 to 85 percent utilization due to prescribed burning in the fall of the previous year.

Next, briefly describe any activities that occurred during the past growing season. Provision is made for logging disturbance, fire, re-vegetation, insects, wildlife effects, and other.

Evaluate climatic conditions. Circle whether temperature was hotter, about average, or colder for this growing season (when the sampling was done), last year, two years ago, three years ago, four years ago. Do the same for precipitation falling between January first and July first: was it above average, about average, or below average. This information should be available from local weather stations. Since precipitation in the mountains can vary considerably from local stations, no attempt is made to quantify differences.

Estimate whether apparent range condition is good, fair, poor, or very poor. In much of region 6, range condition guides can be utilized to determine range condition. For those areas lacking range condition guides, estimate range condition to the best of your ability. Next, estimate apparent range trend. If you have a strong feeling range trend is down, say so; if you have a strong feeling trend is up, say so; if you are not sure about trend, say that also.

And finally, space is provided for other comments. Whenever possible, make these additional comments in the field while you are looking at the transect.

Another important source of supplemental information, particularly in Region 6 where many of our range types are forested, is the effect of tree cover. Cover must be sampled on all forested ranges. Form R-6 2210-61 deals with sampling tree crown cover (page 14).

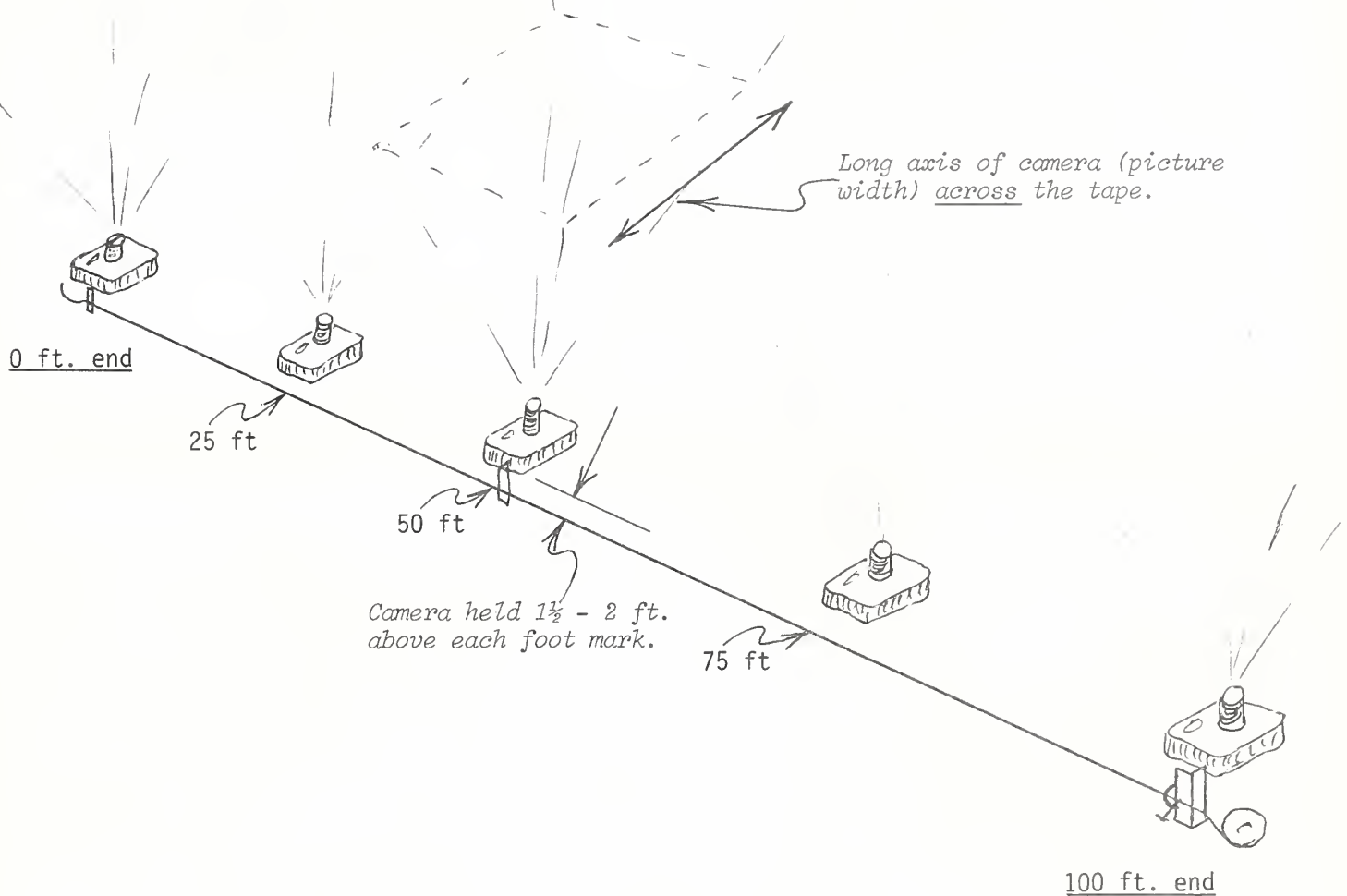
Form R-6 2210-57 is illustrated in Appendix 1. It labels each 1 sq. ft. photograph. One sheet is designed for use with all 20 plots on a transect. Print required information in letters similar in size to those on the form. This will insure readability on photographs. For photo plot 1, circle number 1, place form on ground next to the tape and adjacent to the sq. ft. plot and photograph. For plot 2, cross out number 1 and circle number 2. For plot 3, cross out number 2 and circle 3. Repeat for all 20 plots. Use a new sheet for transect number 2.

Tree Crown Cover Sampling

Sampling tree crown cover is appropriate on both 1 sq. ft. and 9 sq. ft. transects. It may be desirable on special transects where tree cover is important. Photographs are used to record overhead cover above the 0, 25, 50, 75, and 100 ft. marks. Percent crown cover is determined by dot grid or planimetering on the pictures thus both observer and instrument error are greatly reduced. The technique for crown cover photography is shown on the next page.

TREE CROWN COVER PHOTOGRAPHS

For either 1 sq.ft. or 9 sq.ft. transects.



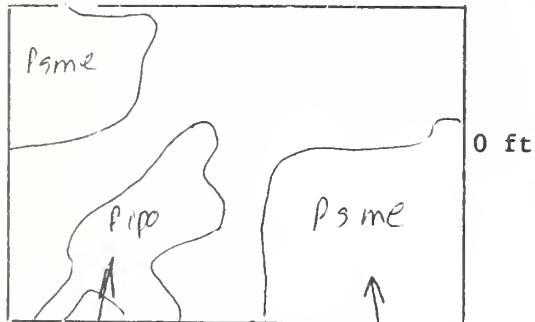
Form R-6 2210-61 is illustrated on the next page. It provides for mounting pictures, identifying tree species, and recording percent cover. Fill in date, Forest, District, range area (allotment), unit, cluster and transect. A 35 millimeter camera with 50 to 55 mm lens is used without a three dimensional stereo attachment. Photograph tree crown cover over the 0, 25, 50, 75, and 100 footmarks of the tape. Get close to the ground so camera is 1 ½ to 2 feet above the tape at each location. Long axis of camera should be across the tape. When trees exceed 60 ft. in height, they will appear in pairs of photographs as noted on page 14. Therefore, each and every tree along the entire 100 foot tape will be shown. The sequence of crown cover pictures must be determined by sequence of photographs: always start at the zero end of the tape first, then follow with the 25, 50, etc. photographs.

Date 8-14-76

PHOTO RANGE TREND SAMPLE

TREE COVER

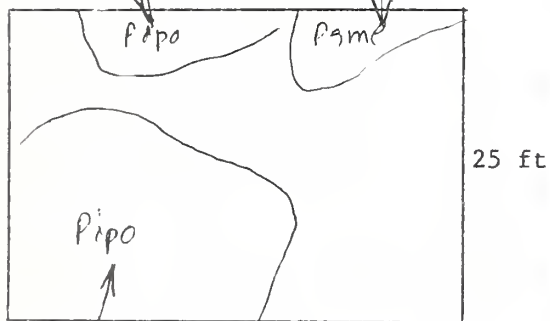
Forest Ochocho
 District Big Summit
 Range Area Jungle G. Unit North
 Cluster 8 Transect 1



Species	% cover	Species	% cover
<u>Psme</u>	<u>44 %</u>		<u>%</u>
<u>Pipo</u>	<u>15 %</u>		<u>%</u>
	<u>%</u>	TOTAL =	<u>59 %</u>

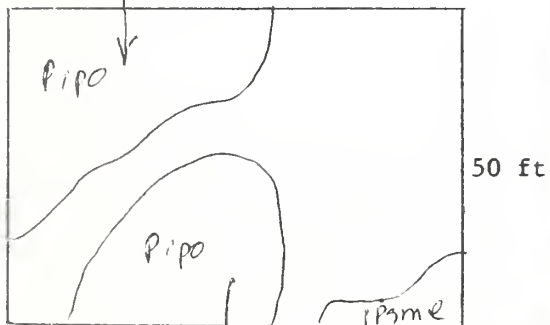
same tree

same tree



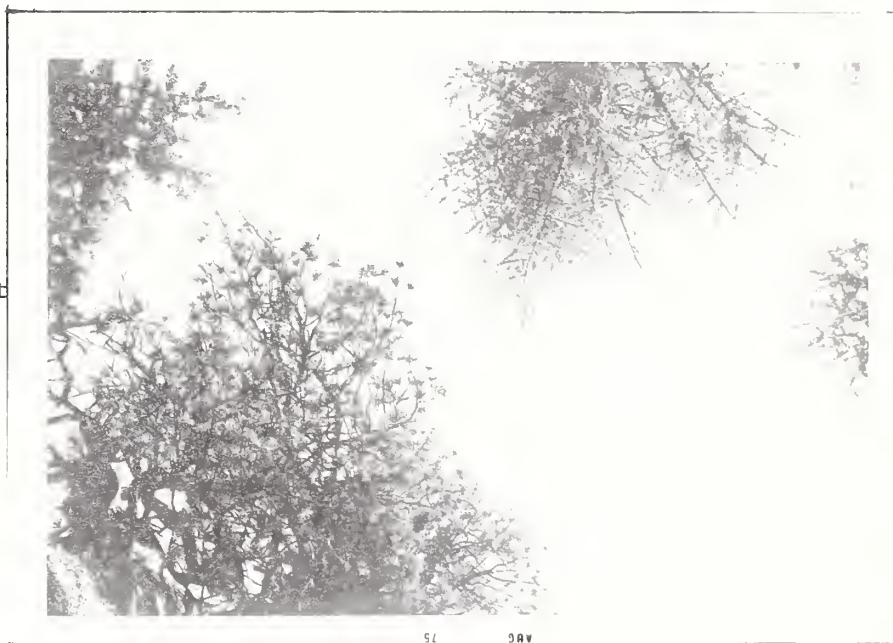
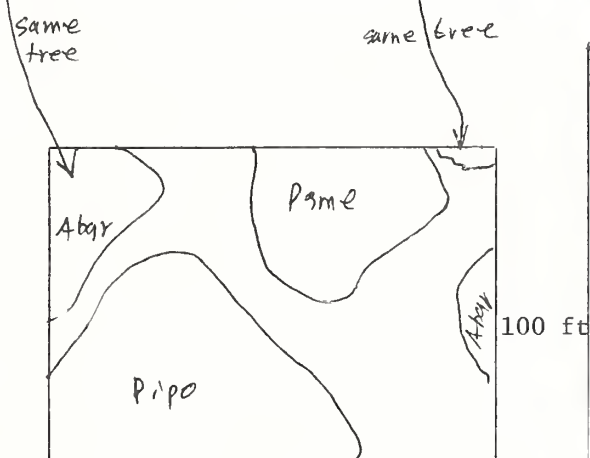
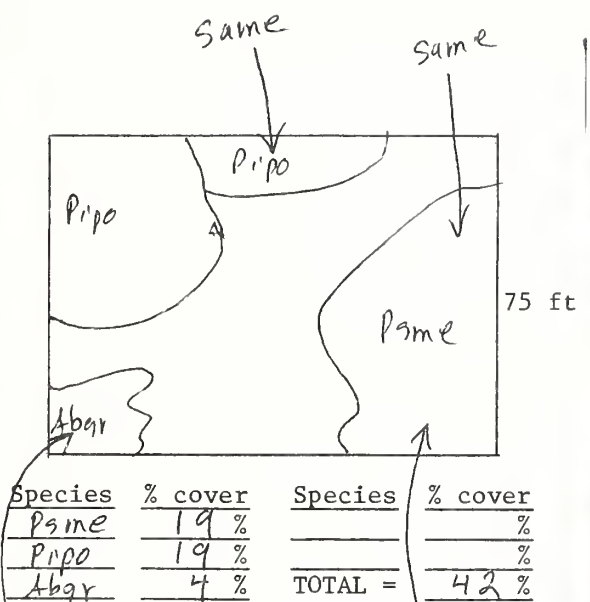
Species	% cover	Species	% cover
<u>Psme</u>	<u>6 %</u>		<u>%</u>
<u>Pipo</u>	<u>46 %</u>		<u>%</u>
	<u>%</u>	TOTAL =	<u>52 %</u>

same tree



Species	% cover	Species	% cover
<u>Pipo</u>	<u>43 %</u>		<u>%</u>
<u>Psme</u>	<u>3 %</u>		<u>%</u>
	<u>%</u>	TOTAL =	<u>46 %</u>





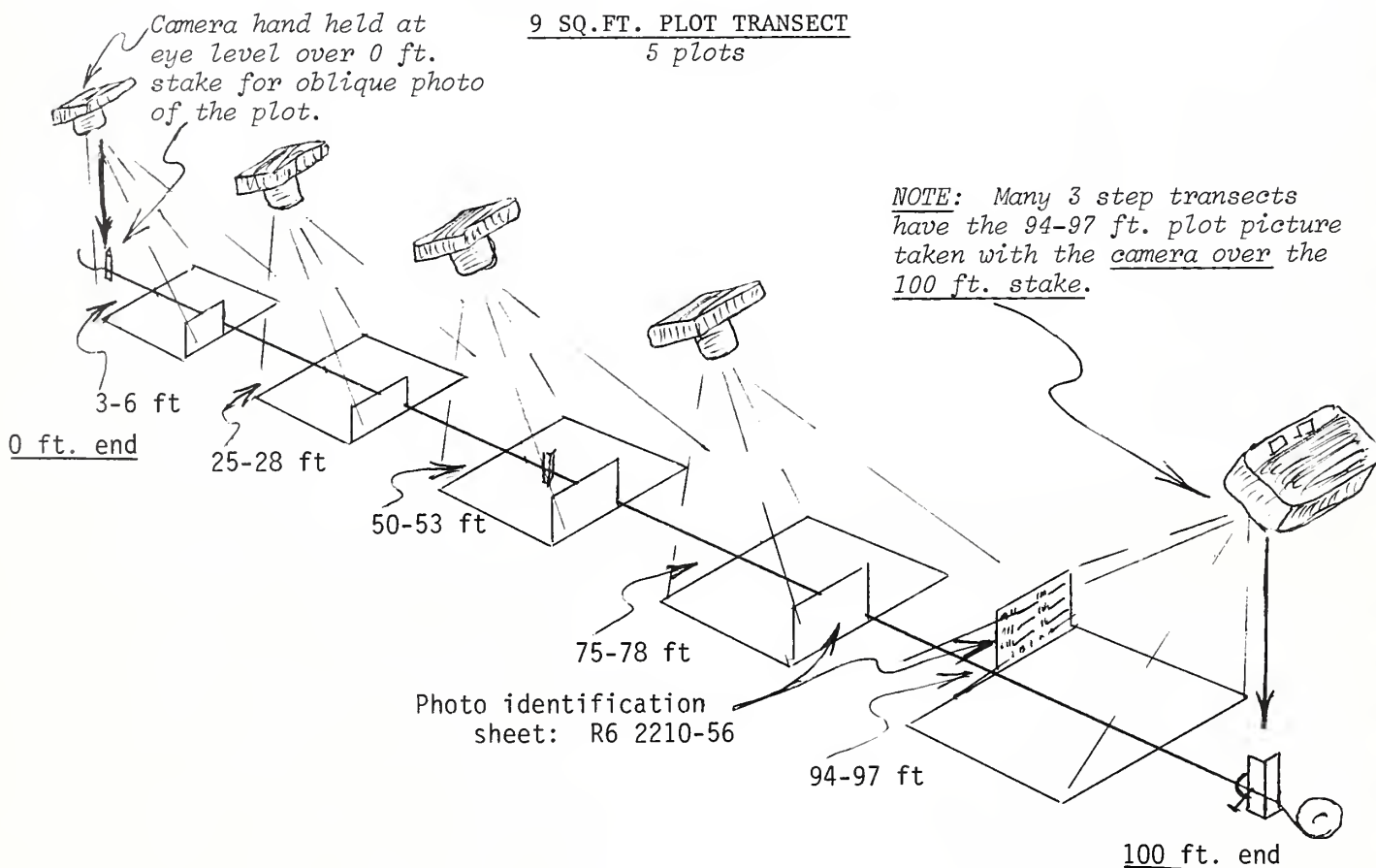
SUMMARY

Species	Ave. % cover
Psme	17 %
Pipo	30 %
Abqr	3 %
	%
	%
	%
	%
TOTAL =	50 %

Form R-6 2210-61 is not required for field use. Attach crown cover photos to the form and identify trees by species as shown. Percent tree cover is determined by measuring how much of each photograph is occupied by tree crown. This can be done by planimetering or by a dot grid system. List by species on the form. In the illustration, crown cover over the zero footmark was 15 percent for ponderosa (PIPO) and 44% for Douglas-fir (PSME); over the 25 footmark it was 46 percent for ponderosa pine, and 6 percent for Douglas-fir. To summarize tree cover on page 2 of the form, determine average cover by species and total.

Nine Square Foot Plot Transect.

General photographs from the 0 ft. and 100 ft. ends are required. The 9 sq. ft. plot transect is different in several respects from the 1 sq. ft. transect: a three dimensional stereo adapter is not used; plot photographs are taken at eye level from an oblique angle rather than overhead; plots are not designed to measure change; and photograph of the last plot is taken from a different direction. Photo plot one is taken with camera over the zero foot stake and the plot at 3-6 feet, whereas the last plot at 94-97 feet is taken with camera over the 100 ft. end stake photographing back down the line to the plot. This technique was used in the Three Step Method.



Form R-6 2210-60 is illustrated on the next page. It is used to diagram plant species and mount photographs of five plots. Each photograph is identified by form R-6 2210-56. On form '60 fill in date, Forest, District, etc. Place a 9 sq. ft. plot between the 3 and 6 ft. marks. Roughly diagram location of each species and label. Fill in Form R-6 2210-56, circle photo 1 and place at a far corner of the plot. Hand hold camera (without stereo attachment) over 0 ft. stake, make sure the photo identification sheet is visible and photograph. Next, record by species shrub and tree under 6 ft. tall crown cover between the 0 ft. and 6 ft. marks noting beginning and ending footmarks and distance in feet. A single species may have more than one intercept if more than one individual crosses the tape between 0 and 6 feet.

Move the plot to 25-28 ft., repeat diagrams, photography, and shrub cover between footmarks 6 and 28 ft. Remember to X out photo 1 and circle photo 2 on Form R-6 2210-56. Repeat for all five plots. Remember to photograph plot 5 (94-97 ft.) from the 100 ft. end. Appendix 2 has a complete form R-6 2210-60 which may be duplicated for field use. Note that footmarks for each plot are listed along with footmarks between which line intercept is to be measured.

Following sampling, fill in summary on the last page of Form R-6 2210-60. It is exactly the same summary sheet used with 1 sq. ft. plots and the procedure is identical.

If the site is forested, tree crown cover must be sampled using form R-6 2210-61. The crown cover example was taken on this 9 sq. ft. transect.

Form R-6 2210-56 (Appendix 1) is used to identify each of the plot photos. One sheet is designed to serve all five plots. Print information required in letter as large as those on the form. Circle transect number and photo number 1. After plot 1 is photographed, cross out 1 and circle 2 for the second plot, repeat for all 5 plots.

The 9 sq. ft. plot is not a scientific sample because five plots are not enough for frequency and nine square feet is too large a plot for frequency distribution. In many cases, two or more species will occur as 100 percent frequency. A scientist cannot determine whether plants were spaced at 2 feet 10 inches distance (which would mean 100 percent frequency) or at 10 inches distance (which would also result in 100 percent frequency). The difference between 10 inches and 2 feet 10 inches can be tremendously important in evaluating range trend. Estimating vegetation density and crown cover is possible by close scrutiny of each photograph. The intent of 9 sq. ft. sampling is to document general changes in vegetation and soil. A grid may be overlaid on the photograph and changes in plant density or crown cover can be approximately measured between photographs of the same area.

Range Trend Analysis Summary Sheet.

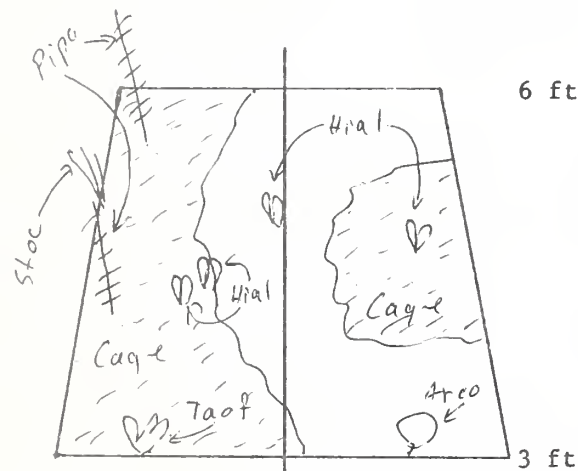
Form R-6 2210-62 is designed to summarize two or more readings on a transect. At the top, circle either 1 sq. ft. --20 plot sample or 9 sq. ft. -- 5 plot sample. Forest, Range Area, unit, cluster and transect number are provided. It is illustrated on pages 19 and 20.

Date 8-14-75
 Forest Ochoco
 District Big-Summit
 Range Area Jungle Cr
 Unit North
 Cluster 8
 Transect 1
 Investigator F.C. Hall
 Season of use Fall % use 30
 Grazing system Deferred-rotation

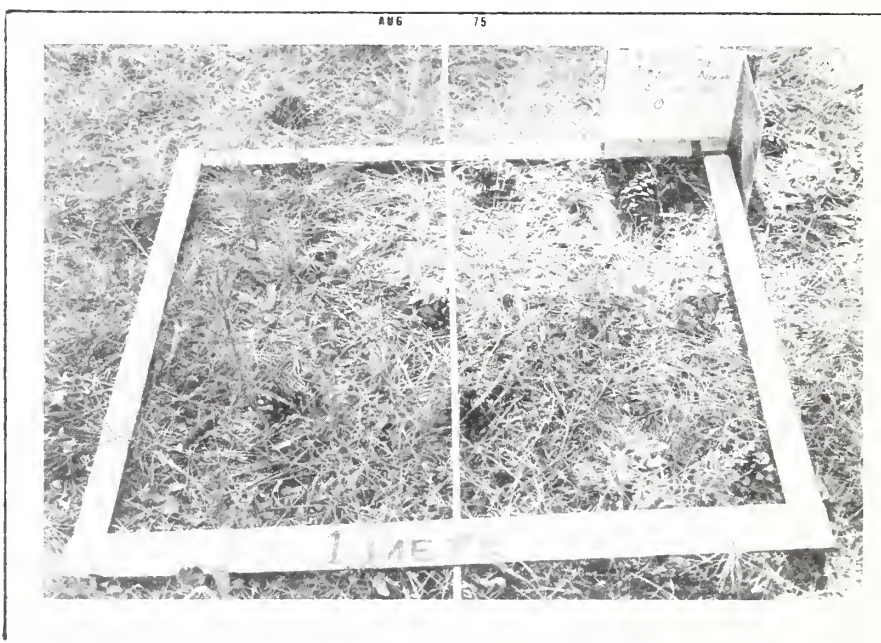
Remarks _____



PLOT SIZE 9 sq.ft. (1 sq.meter)



Line Intercept 0 ft to 6 ft			
Species	From	To	Feet
<i>Spirea betulifolia</i>	0.5	1.0	.5
" "	2.0	2.5	.5



Elements	Averages by Year									
	1966	1971	1976							
Range Condition Guide & Date										
Pine-Pinegrass 6-24-58	X									
Mix conifer-Calamagrostis 4-67		X								
Pondusca-bitterbrush-fescue 10-76			X							
Decreasers (# plots)	14	13	11							
Palatable Increases (# plots)	20	19	19							
Unpalatable Increases (# plots)	5	4	5							
Invaders (# plots)										
Bare Soil (# plots)	8	7	5							
Gravel Pavement (# plots)										
Rock (# plots)	3	3	2							
Litter (# plots)	16	18	20							
Moss/lichens (# plots)	3	4	3							
%Utilization by Species										
Fescue		30	10							
Needlegrass	10	50	40							
Ross sedge	60	5	40							
Lupine	10		10							
Season of Use	Fall	Spring	Summer							
Climate										
Temp: Current	0	+	0							
Last year	0	0	+							
2 Yrs. ago	-	0	0							
3 Yrs. ago	0	-	0							
4 Yrs. ago	+	0	+							
Ppt: Current	0	+	0							
Last year	-	0	0							
2 Yrs. ago	-	0	+							
3 Yrs. ago	0	-	-							
4 Yrs. ago	+	-	+							
Apparent range condition	G	G	G							
Apparent range trend	none	none	down							

Each time a transect is read, year of reading is entered in the space under "Averages by Year", for example 1966, 1971, 1976. Tree crown cover is obtained from transect summary, Form R-6 2210-61. For example, in 1966 ponderosa pine averaged 48 percent crown cover, in 1971 it was 46 percent crown cover, and in 1976 it was 44 percent; white fir was 8 percent in 1966, 16 percent in 1971, and 22 percent in 1976. These averages by species are totaled by year.

Shrub line intercept expressed in number of feet on the 100 foot line is listed by species by year similar to tree crown cover. It is obtained from the transect summary on either Form R-6 2210-59 or -60. In the example, manzanita line intercept was 14 feet in 1966, 12 feet in 1971, and 11 feet in 1976. Shrub line intercept for each year is totaled as shown.

Frequency by species is entered under each year as obtained from the summary sheet on Form R-6 2210-59 or -60. Frequency is expressed in number of plots. For the example, Idaho fescue had a frequency of 12 plots in 1966, 10 plots in 1971, and 8 plots in 1976 from a total of 20 possible plots. Needlegrass had a frequency of 20 plots in 1966, 19 plots in 1971, and 17 plots in 1976. There is no total for frequency.

The second page provides summarization of several items, some taken directly from transect summary sheets and some interpreted by range condition guides. Year of transect reading is again entered under "Averages by Year". The first section deals with decreasers and increasers as listed in range condition guides. Since these guides are periodically updated and refined, a space is provided for noting which condition guide was used. For example, pine-pinegrass of 6-24-58 was used for evaluating 1966 range condition and an X is placed under 1966. Mixed conifer-Calamagrostis of 4-67 was used for the 1971 transect summary. Pine-bitterbrush-fescue of the pumice zone dated 10-76 was used for evaluation in 1976.

The procedure for determining frequency of decreasers and increasers is as follows:

1. Information is not available from the transect summary sheet on either Form R-6 2210-59 or -60.
2. Instead, note in the latest range condition guide which plant species are listed as decreaser, palatable increaser, unpalatable increaser or invader.
3. With this species list by category, go to the individual plot diagrams for each transect (i.e. for 1966, 1971, and 1976). Tally the number of sample plots containing decreasers, palatable increasers, unpalatable increasers, and invaders. Enter the tally sum by year. In the example, decreasers occurred in 14 plots in 1966, 13 plots in 1971, and 11 plots in 1976. Number of plots containing bare soil, gravel pavement, rock, litter, and moss/lichens can be taken from the transect summary sheets (Form R-6 2210-59 or -60). Enter these totals for each year, i.e. bare soil occurred in 8 plots in 1966, 7 plots in 1971, and 5 plots in 1976.

Enter data for percent utilization by species directly from transect summaries. In the example, fescue did not show utilization in 1966, in 1971 it was used 30 percent, and in 1976 it was used 10 percent. Enter season of use at the bottom of the section such as fall use in 1966, spring use in 1971. and summer use in 1976. Apparently, fescue was not utilized in fall grazing but it was utilized in spring grazing.

Transfer transect summary information on temperature and precipitation using the symbols circled. For example, the summary for 1966 showed temperature to be average for that year, average the "last" (previous) year, lower 2 yrs. ago (1964), average 3 yrs. ago (1963) and above average 4 yrs. ago (1962). For 1971, information is provided on temperature and precipitation from 1968 to 1971. In this way, 16 years of climate are depicted on the example. And finally, enter estimated range condition and range trend at the bottom of Form R-6 2210-62.

Interpretation of these data and evaluation of Three Step information are discussed in Regional Guide 2-3, Interpretation of Range Trend.

Special Transect Use.

Specific directions for special transect use cannot be given because "anything goes". For example, a person may wish to document gully conditions as depicted below. In this case, a 100 foot line was not necessary; instead a 50 foot transect was placed across the gully. End photographs document the general situation. The gully was noted as starting at footmark 28 and extending to footmark 35. In the center, under footmark 31, the gully was measured as 2 ½ feet deep. Three additional photographs were utilized. One was located over footmark 23 and looked down transect across the gully, another was located at footmark 40 looking up transect across the gully, and another photograph was taken from the bottom of the gully down to the transect line. This photograph was located 15 feet away at a 90 degree angle to the line opposite footmark 31. In this case a size control board placed at the bottom of the gully would be highly desirable.

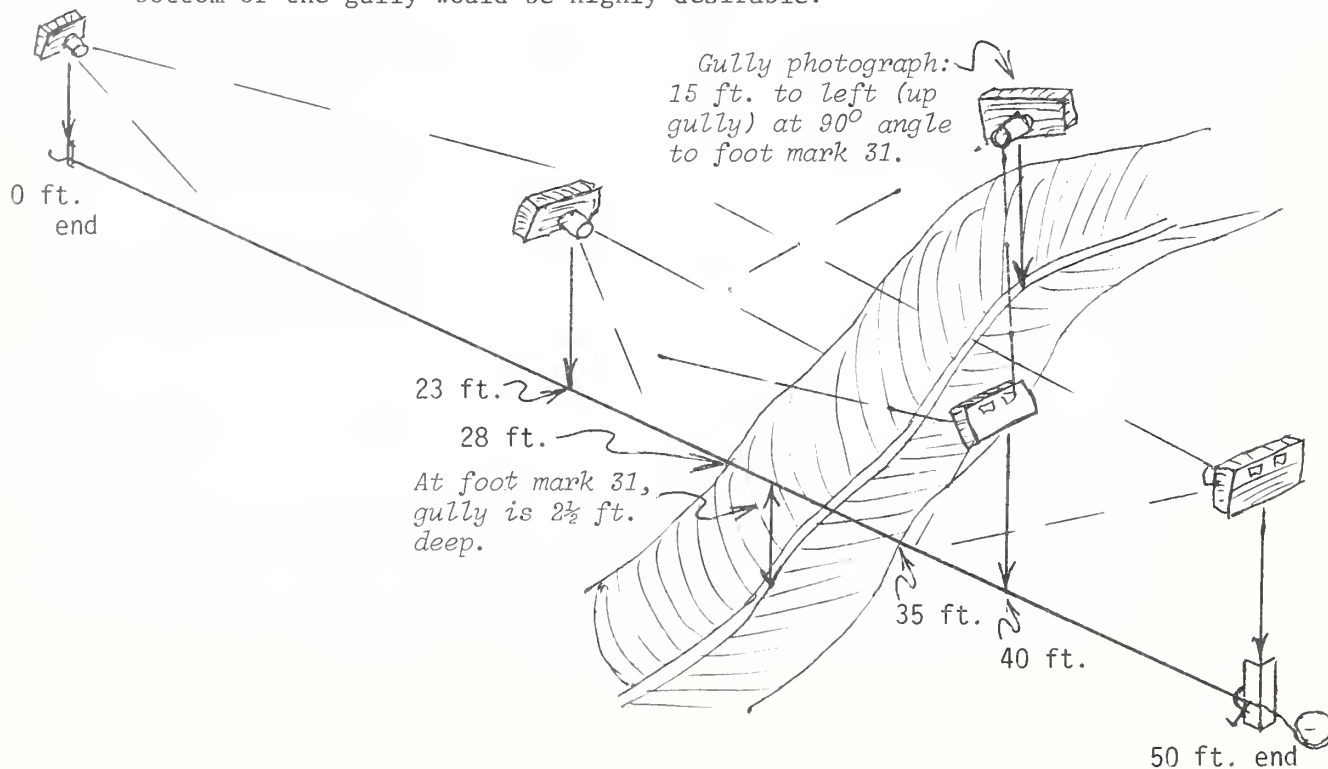




Figure 1. Sheet erosion eating into grassland vegetation. A line transect across this change and photographic documentation can be used to assess rate of erosion.



Figure 2. Beargrass colonies apparently invading a sedge mountain meadow. A transect line across the colonies with photographic documentation can be used to evaluate future progression and change.

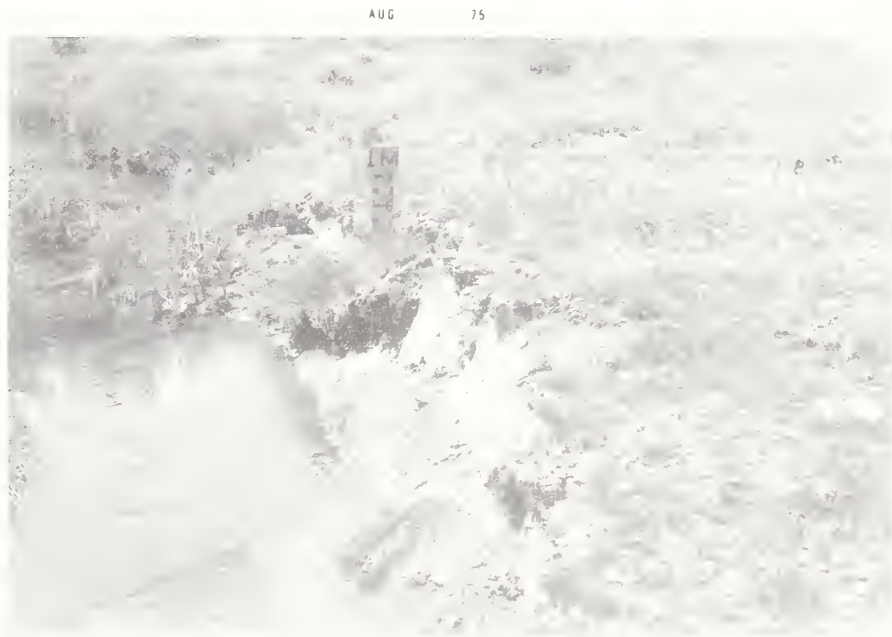


Figure 3. Photographic sampling of stream bank stability. A short transect is extended from a trend plot stake at a specified magnetic direction and the distance to the current stream bank is recorded. Photo points are established to record current and future conditions.

Form R-6 2210-58, cluster description, should be used with special transects. As described earlier, this form provides sample location description, sample layout map, notation of grazing systems, ecological kind of plant community, and animal impacts, as well as site data and soil descriptions. Other than Form R-6 2210-58, the investigator must be innovative.

I have used photo identification Form R-6 2210-55 for special transects. Transect number 1, 2, and 3 were crossed out and replaced by a word or two description. The form thus provides for labeling up to five pictures of specific items. Note photograph number on the map at the bottom of Form R-6 2210-58.

Special transects have been used:

1. To document gully and sheet erosion (Figure 1).
2. To document changes in vegetation such as encroachment of lodgepole pine or shrubs into a meadow, or the spread of beargrass into a short sedge mountain meadow (Figure 2).
3. To document and evaluate streambank erosion and breakage (Figure 3).

SUMMARY

Three kinds of photo sampling have been recommended: 1 sq. ft. frequency utilizing 20 plots on a 100 foot transect 9 sq. ft. documentation patterned after Three Step Method technique, and a special situation documentary photo system which is completely fluid to meet needs of the land manager. Photographic documentation is stressed in range trend sampling following recommendations by Reppert and Francis (1970). They showed that photographs required in the Three Step Method were the most useful aspect of the entire sampling system. Hopefully, photographs will greatly reduce observer error by documenting field conditions in pictures such as plant crown cover, plant density, plant basal area and amount of ground occupied by rocks and erosion pavement. An observer can measure conditions 10 or 15 years ago and compare them to today. These proposed sampling systems should overcome the Three Step Method's procedural problems of observer error, measurement bias and small surface area sample (a 3/4 inch loop).

They will not solve problems of poor training and inadequate attention by people. Good quality photographs must be taken, transects must be located in homogeneous areas, appropriate ecologically oriented range condition guides must be applied, plant species must be correctly identified, and the sampling method must be laid out and run in the same way at each reading.

Appendix 1

Photograph Identification Forms

1. These forms may be duplicated for field use.
2. Duplicate on YELLOW PAPER.
Yellow paper does not reflect light like white paper, therefore it can be photographed more effectively.

DATE _____

0 100

Circle which end of tape

DIST _____

AREA _____

UNIT _____

CLUST _____

1 2 3

Circle transect number;
X out last number.

DATE _____

DIST _____

AREA _____

UNIT _____

CLUST _____

TRANS 1 2 3

Circle current transect number; X out last transect.

PHOTO 1

2

3

4

5

Foot marks

3 - 6

25 - 28

50 - 53

75 - 78

94 - 97

Circle current photo plot number; X out last number.

DATE _____ DIST _____

AREA _____ UNIT _____

CLUSTER _____ TRANS. 1 2 3

Circle transect number, X out last number

1	2	3	4	5	6	7	8	9	10
Ft 0-1	5-6	10-11	15-16	20-21	25-26	30-31	35-36	40-41	45-46
11	12	13	14	15	16	17	18	19	20
50-51	55-56	60-61	65-66	70-71	75-76	80-81	85-86	90-91	95-96

Circle current photo plot number; X out last number.

Appendix 2

Transect Forms for:

1 sq. ft. plots

9 sq. ft. plots

Tree crown cover

Transect Summery

1. These forms are complete and may be duplicated for field use.
2. Duplicate forms on YELLOW PAPER. Yellow paper does not reflect light like white paper, therefore it can be read with less eye strain.

PHOTO RANGE TREND SAMPLE: 1 sq. ft. 9 sq. ft. Special

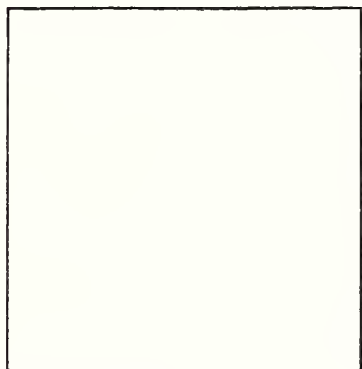
Cluster Description

Date Installed _____	Site Data: Elevation _____	% Slope _____
Forest _____	Slope aspect: N NE E SE S SW W NW	
District _____	Slope position: Top Up 1/3 Mid Low 1/3 Bottom	
Range Area _____	Micro topography: Convex Flat Concave	
Unit _____	Macro topography: Flat Undulating Rolling Steep	
TRI: Compartment _____	Rough Broken	
Cell _____	Geology: _____	
Cluster _____	Deposition: Wind Stream Lake Colluvial Residual	
Number of transects: 1 2 3	Other _____	
ECOCCLASS _____	Material: Limestone Mudstone Sandstone	
Community Type _____	Granitic Serpentine Dioritic	
	Basaltic Andesitic Rhyolitic	
	Tuffaceous Cinders Pumice Ash	
	Composite Other _____	
Grazing system: _____	Soil: _____	
Type _____ Date _____	Kind of Restriction: Absent Clay pan Bedrock	
_____ Date _____	Cemented Other _____	
_____ Date _____	Depth to restriction _____ Rooting Depth _____	
Kind of animal: Cattle Sheep	Surface compaction: None Slight Moderate Severe	
Horses Goats _____	Soil Profile Stone: Absent Gravelly Stony	
	Topsoil: Less 10% 10-30% 30-50% 50-70% Over 70%	
	Subsoil: Less 10% 10-30% 30-50% 50-70% Over 70%	
Location: _____ Sec. _____	Soil Texture: _____	
T. _____ R. _____	Topsoil: Sandy Loamy Silty Clayey Ashy	
Description: _____	Subsoil: Sandy Loamy Silty Clayey Ashy	
_____	Other: _____	
_____	_____	
_____	_____	
_____	_____	

MAP

Date _____
 Forest _____
 District _____
 Range Area _____
 Unit _____
 Cluster _____
 Transect _____
 Investigator _____
 Season of use _____ % use _____
 Grazing system _____
 Remarks _____

PLOT SIZE 1 sq.ft.

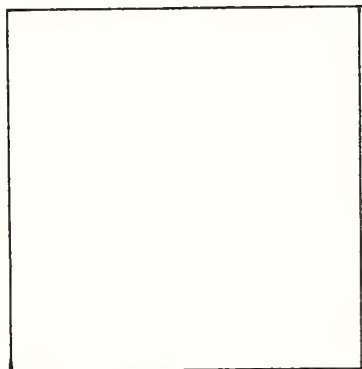


0 ft

1 ft

Line Intercept

Species	From	To	Feet



5 ft.

6 ft.

Line Intercept

Species	From	To	Feet

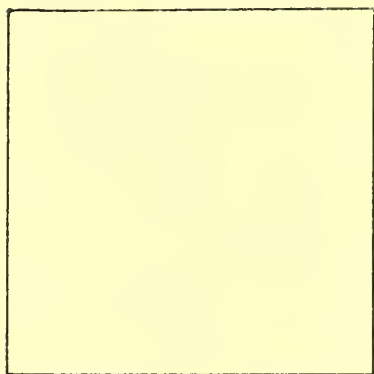
General photograph down the 100 ft.

tape from the 0 ft. end.

(Size control board at 30 ft.)
(Photo identification paper at 15 ft.)

Photograph of Plot 1.

Photograph of Plot 2



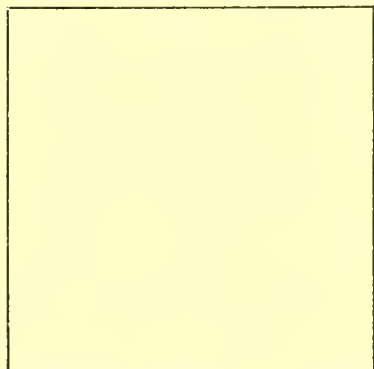
10 ft

Photograph of Plot 3

11 ft.

Line Intercept

<u>Species</u>	<u>From</u>	<u>To</u>	<u>Feet</u>



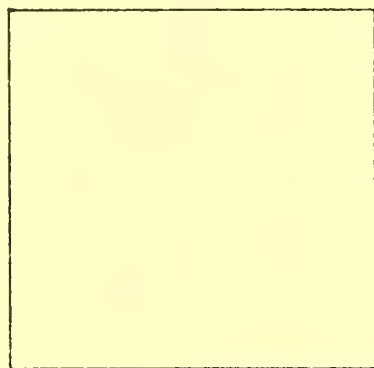
15 ft

Photograph of Plot 4

16 ft

Line Intercept

<u>Species</u>	<u>From</u>	<u>To</u>	<u>Feet</u>



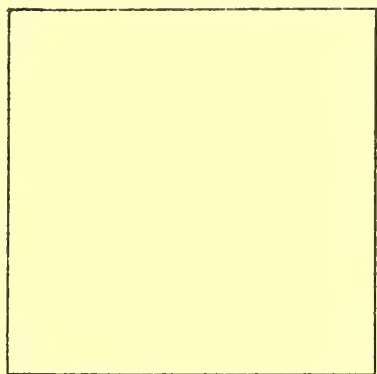
20 ft

Photograph of Plot 5

21 ft

Line Intercept

<u>Species</u>	<u>From</u>	<u>To</u>	<u>Feet</u>



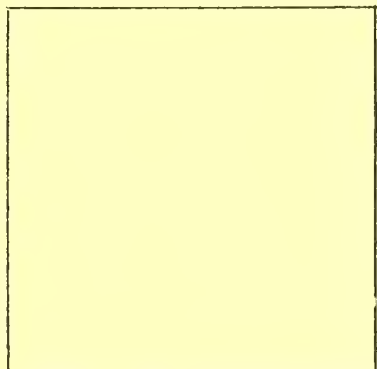
25 ft

26 ft

Line Intercept

<u>Species</u>	<u>From</u>	<u>To</u>	<u>Feet</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Photograph of Plot 6



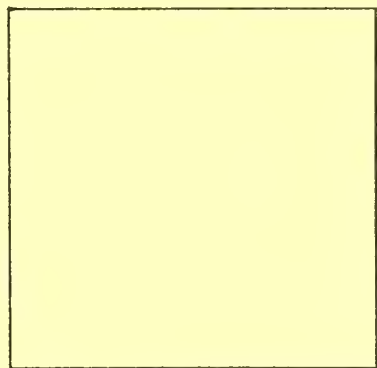
30 ft

31 ft

Line Intercept

<u>Species</u>	<u>From</u>	<u>To</u>	<u>Feet</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Photograph of Plot 7



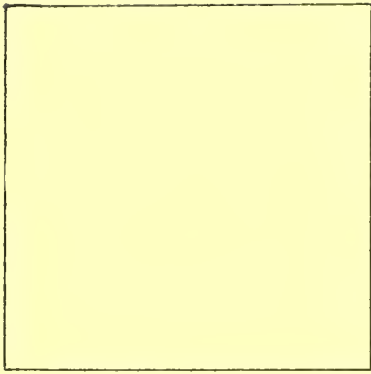
35 ft

36 ft

Line Intercept

<u>Species</u>	<u>From</u>	<u>To</u>	<u>Feet</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Photograph of Plot 8



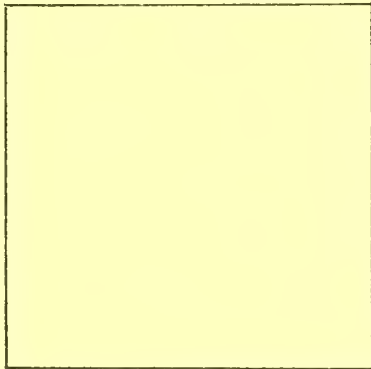
40 ft

41 ft

Line Intercept

<u>Species</u>	<u>From</u>	<u>To</u>	<u>Feet</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Photograph of Plot 9



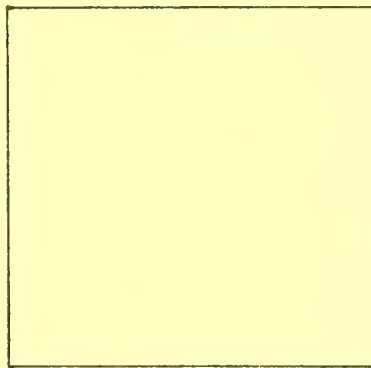
45 ft

46 ft

Line Intercept

<u>Species</u>	<u>From</u>	<u>To</u>	<u>Feet</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Photograph of Plot 10



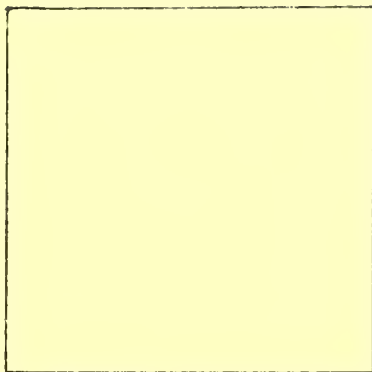
50 ft

51 ft

Line Intercept

<u>Species</u>	<u>From</u>	<u>To</u>	<u>Feet</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Photograph of Plot 11



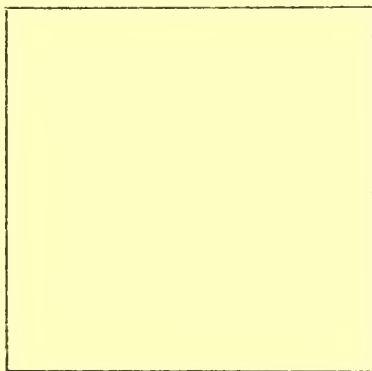
55 ft

56 ft

Line Intercept

<u>Species</u>	<u>From</u>	<u>To</u>	<u>Feet</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Photograph of Plot 12



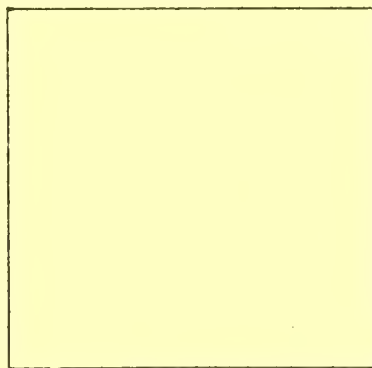
60 ft

61 ft

Line Intercept

<u>Species</u>	<u>From</u>	<u>To</u>	<u>Feet</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Photograph of Plot 13



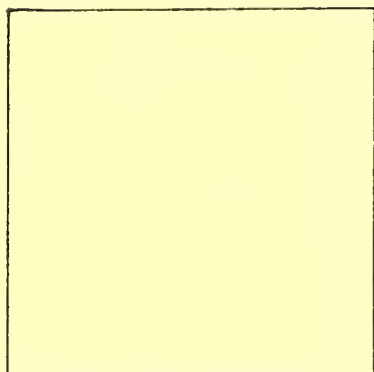
65 ft

66 ft

Line Intercept

<u>Species</u>	<u>From</u>	<u>To</u>	<u>Feet</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Photograph of Plot 14



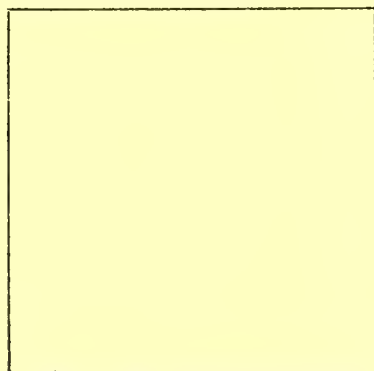
70 ft

71 ft

Line Intercept

<u>Species</u>	<u>From</u>	<u>To</u>	<u>Feet</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Photograph of Plot 15



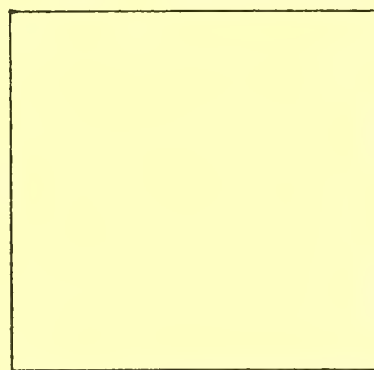
75 ft

76 ft

Line Intercept

<u>Species</u>	<u>From</u>	<u>To</u>	<u>Feet</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Photograph of Plot 16



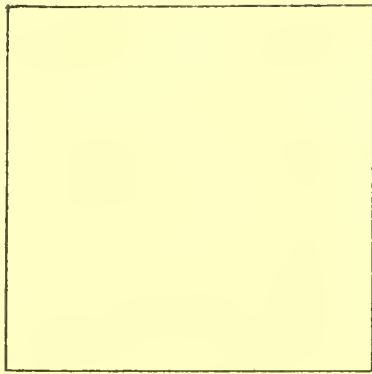
80 ft

81 ft

Line Intercept

<u>Species</u>	<u>From</u>	<u>To</u>	<u>Feet</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Photograph of Plot 17



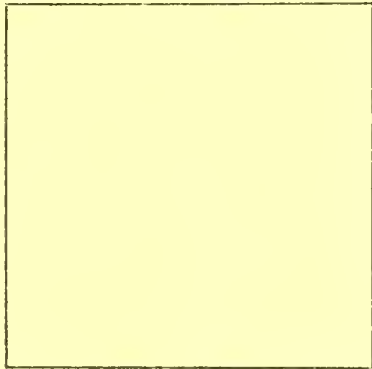
85 ft

86 ft

Line Intercept

<u>Species</u>	<u>From</u>	<u>To</u>	<u>Feet</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Photograph of Plot 18



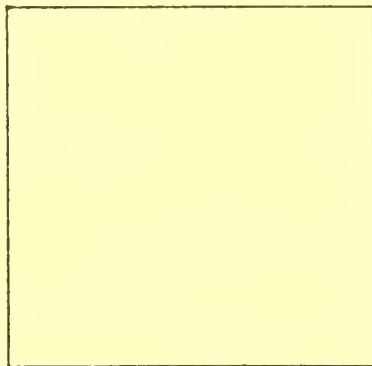
90 ft

91 ft

Line Intercept

<u>Species</u>	<u>From</u>	<u>To</u>	<u>Feet</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Photograph of Plot 19



95 ft

96 ft

Line Intercept

<u>Species</u>	<u>From</u>	<u>To</u>	<u>Feet</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Photograph of Plot 20

<u>Species</u>	<u>Frequ.</u>	<u>Interc.</u>
Bare Soil		
Gravel pavement		
Rock		
Litter		
Moss/lichens		

Logging _____
Fire _____
Revegetation _____
Insects _____
Wildlife _____
Other _____

	<u>This Yr.</u>	<u>Last Yr.</u>	<u>2 yrs.</u>	<u>3 yrs.</u>	<u>4 yrs.</u>
Temp.	+ 0 -	+ 0 -	+ 0 -	+ 0 -	+ 0 -
Ppt.	+ 0 -	+ 0 -	+ 0 -	+ 0 -	+ 0 -

Apparent range condition _____
Apparent Trend _____

[illegible]



28 ft

25 ft

Line Intercept 6 ft to 28 ft

A diagram of a trapezoid with a vertical line segment representing its height. The top base is labeled 53 ft and the bottom base is labeled 50 ft.

53 ft

50 ft

Photograph of plot 3

Line Intercept 28 ft to 53 ft

[illegible]

75 ft

[illegible]

STOP: Change photograph direction. Most 3 step
photos were taken with the camera over the
100 ft. end -- check the prior photographs.

94 ft

97 ft

[illegible]

Photograph of plot 5

[illegible]

Bare Soil
Gravel pavement
Rock
Litter
Moss/lichens

[illegible]

Logging _____
Fire _____
Revegetation _____
Insects _____
Wildlife _____
Other _____

	<u>This Yr.</u>	<u>Last Yr.</u>	<u>2 yrs.</u>	<u>3 yrs.</u>	<u>4 yrs.</u>
Temp.	+ 0 -	+ 0 -	+ 0 -	+ 0 -	+ 0 -
Ppt.	+ 0 -	+ 0 -	+ 0 -	+ 0 -	+ 0 -

Apparent range condition _____
Apparent Trend _____

Date _____

PHOTO RANGE TREND SAMPLE

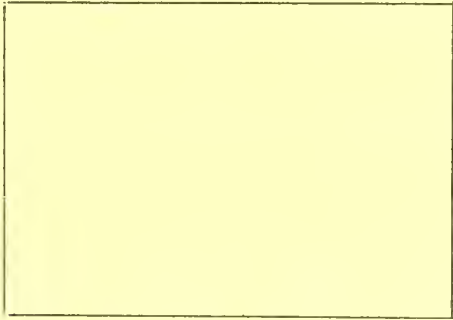
TREE COVER

Forest _____

District _____

Range Area _____ Unit _____

Cluster _____ Transect _____

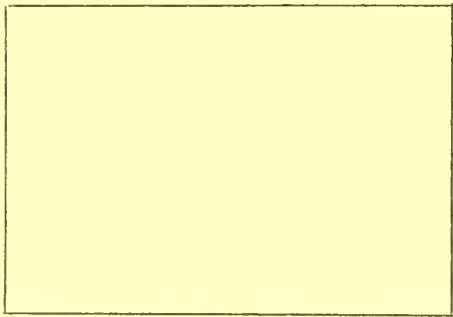


0 ft

Vertical photo of tree cover above

0 foot mark.

<u>Species</u>	<u>% cover</u>	<u>Species</u>	<u>% cover</u>
_____	_____ %	_____	_____ %
_____	_____ %	_____	_____ %
_____	_____ %	TOTAL =	_____ %

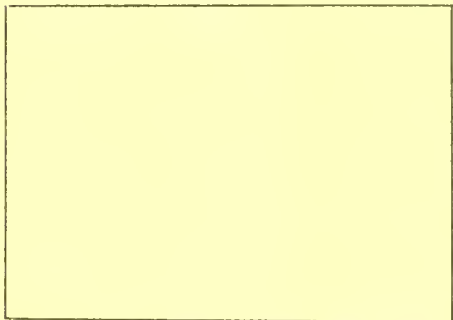


25 ft

Vertical photo of tree cover above

25 foot mark

<u>Species</u>	<u>% cover</u>	<u>Species</u>	<u>% cover</u>
_____	_____ %	_____	_____ %
_____	_____ %	_____	_____ %
_____	_____ %	TOTAL =	_____ %

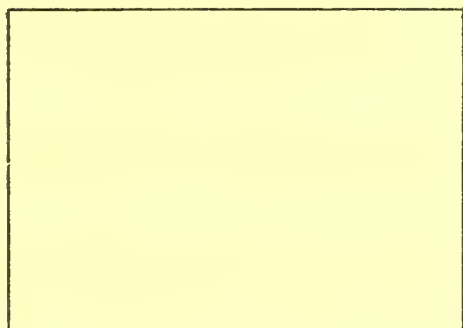


50 ft

Vertical photo of tree cover above

50 foot mark.

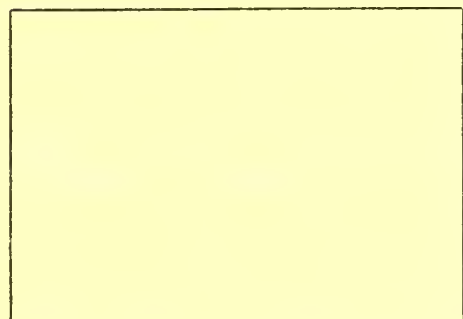
<u>Species</u>	<u>% cover</u>	<u>Species</u>	<u>% cover</u>
_____	_____ %	_____	_____ %
_____	_____ %	_____	_____ %
_____	_____ %	TOTAL =	_____ %



75 ft

Vertical photo of tree cover above
75 foot mark.

<u>Species</u>	<u>% cover</u>	<u>Species</u>	<u>% cover</u>
_____	_____%	_____	_____%
_____	_____%	_____	_____%
_____	_____%	TOTAL =	_____%



100 ft

Vertical photo of tree cover above
100 foot mark.

<u>Species</u>	<u>% cover</u>	<u>Species</u>	<u>% cover</u>
_____	_____%	_____	_____%
_____	_____%	_____	_____%
_____	_____%	TOTAL =	_____%

SUMMARY

<u>Species</u>	<u>Ave.</u> <u>% cover</u>
_____	_____%
_____	_____%
_____	_____%
_____	_____%
_____	_____%
_____	_____%
_____	_____%
_____	_____%
TOTAL =	_____%

R6 2210-62 3/76

[illegible]

Appendix 3

Equipment specification

Size control board

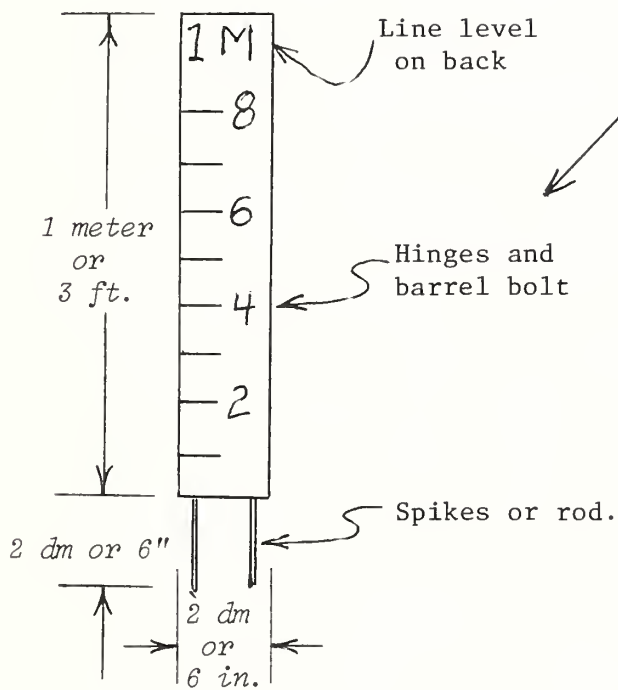
9 sq. ft. plot

1 sq. ft. plot

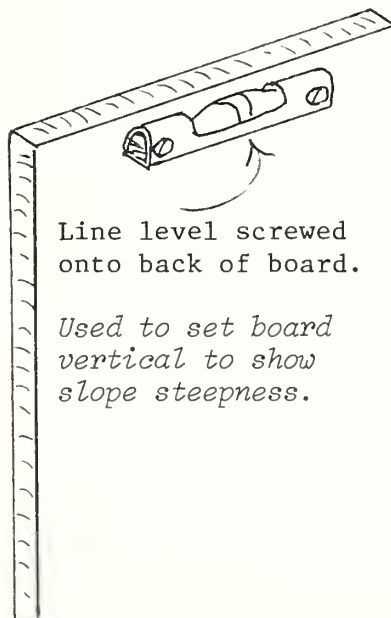
SIZE CONTROL BOARD

Either 3 ft. or 1 meter tall.
Use $\frac{1}{4}$ inch plywood.

Do not place hinges in the center.
Hinge at $1\frac{1}{2}$ feet or 4 dm so top of board will cover spikes when folded.



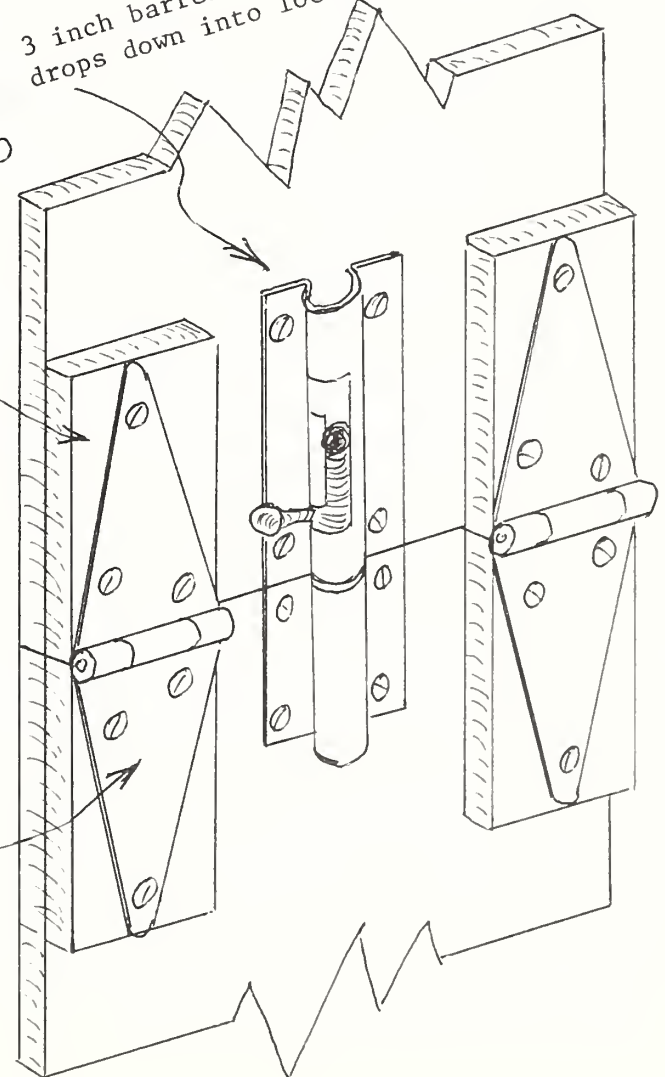
3 inch barrel bolt placed so bolt drops down into locked position.



$\frac{1}{4}$ inch plywood backing to provide clearance for barrel bolt when folded.

3 inch strap hinges

up



1 SQ.FT. PLOT

Use 1/8" by 1" aluminum stock, *bend into proper shape*.
Each side is 12" long.

Cover frame with yellow
cloth tape.

*Yellow increases
visability; cloth
reduces glare.*

*Open end permits slipping
the plot frame under shrubs.*

Black lines at 3 inch intervals.

*Lines used to draw in a grid on
the photograph to aid evaluation
of vegetation changes.*

